

#31

Project Manual
Including Specifications for
The Construction of

City of Raton
Raton Aquatic Center Design Build
Raton, New Mexico 87740
September 2008

06-L-G-375
06-L-G-1549

OWNER:

City of Raton
P.O. Box 910
Raton, New Mexico 87740

ARCHITECT:

John Quinn Pate, RA/RLA
MOLZEN-CORBIN & ASSOCIATES
2701 Miles Road, Southeast
Albuquerque, New Mexico 87109
Phone No.: (505) 242-5700 Fax: (505) 242-0673

In Conjunction with

Sink Conibs Dethlefs
475 Lincoln Street, Suite 100
Denver, Colorado 80203

9/12/08

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ARCHITECT: John Quinn Pate, RA/RLA
Molzen-Corbin & Associates
2701 Miles Road, SE
Albuquerque, New Mexico 87106

Chris Kastelic, Architect
Gudmundur Jonsson, Architect
Sink Combs Dethlefs
475 Lincoln Street, Suite 100
Denver, Colorado 80203

CIVIL: Molzen-Corbin & Associates
2701 Miles Road, SE
Albuquerque, New Mexico 87106

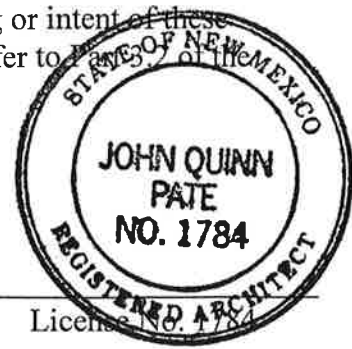
STRUCTURAL: Quiroga-Pfeiffer Engineering Corp.

MECHANICAL: The Ballard Group, Inc.

ELECTRICAL: Innovative Electrical Systems

POOL CONSULTANTS: Counsilman-Hunsaker

The technical material and data contained in the specifications under the supervision and direction of the undersigned, whose seal as a Professional Architect, licensed to practice in the State of New Mexico, is affixed below. All questions about the meaning or intent of these documents shall be submitted to the Architect of Record, in writing. Refer to Instructions to Bidders regarding interpretations.



 ARCHITECT John Quinn Pate

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* Sections indicated with Asterisk were composed by Architect of Record.

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SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project will be constructed under a General Construction Contract.
- B. Work of the Project consists of construction of a 19,360 sq ft natatorium building and associated site work.
- C. Site construction includes earthwork for structures, grading, paving, curb & gutter, and utility extensions.
- D. Construction includes cast in place concrete, masonry, steel, custom casework, insulation, metal roofing & siding, membrane roofing, synthetic stone cladding, doors and windows, finish hardware, glazing, stucco, gyp board systems, ceramic tile, carpeting, acoustic ceilings, painting, specialties, fire detection/alarm, and suppression systems, HVAC system, plumbing, electrical power, lighting and special systems, cast in place concrete pool and associated pool equipment and appurtenances.
- E. The Work consists of:
 - 1. Base Bid: The base Bid includes all elements of construction shown for the complete and operational construction of this project except items indicated as Alternates.
 - 2. Alternates: See Section 01230 for listing of additive alternates to the Base Bid.
- F. Project is designed for expansion at a future date.

1.2 SUMMARY BY REFERENCED

- A. Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, Addenda and Modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and including, but not necessarily limited to, printed material referenced by any of these. It is recognized that work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon, including weather conditions and other forces outside the Contract Documents.

1.3 USE OF THE PREMISES

- A. The immediate premises of work will be at the disposal of the Contractor during the construction period.
- B. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.
- C. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.

1.4 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat 1995" numbering system.

- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions include:
1. Abbreviated Language: Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - b. The word "provide" means to furnish and install, complete and ready for use.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Note Used)

END OF SECTION 01100

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section includes administrative and procedural requirements governing the following:
1. Utility Service Allowances
 2. Cash Allowances

1.2 UTILITY SERVICE ALLOWANCES

- A. Utility service allowances include charges by utility providers associated with the provision of indicated utilities to this Project. Contractor and subcontractor costs and charges to integrate the Work of utility suppliers into the Project for a completely operable facility are not included in the Utility Service Allowance but must be included in the Contract sum/price.
- B. Submit proposals for purchases of services scheduled below in the form specified for Change Orders.
- C. Submit invoices or delivery slips to show actual costs for services provided, delivered and installed.
- D. At project closeout, credit unused allowance amounts to the Owner and charge for overage amounts by Change Order
- E. Utility Service Allowance Schedule
- | | |
|-----------------------|---|
| 1. Electric Service: | Allow the amount of \$ <u>15,000.00</u> . |
| 2. Gas Service: | Allow the amount of \$ <u>7,500.00</u> . |
| 3. Water Service: | Allow the amount of \$ <u>0.00</u> . |
| 4. Sewer Service: | Allow the amount of \$ <u>0.00</u> . |
| 5. Telephone Service: | Allow the amount of \$ <u>0.00</u> . |

1.3 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of product to Contractor or Subcontractor, less applicable trade discounts; delivery to site and applicable taxes.
- B. Costs Not Included in Cash Allowances But Included in Contract Sum/Price:
1. Product handling at site, including unloading, uncrating, and storage; protection of products from elements and from damage
 2. Labor for installation and finishing.
- C. Architect/Engineer Responsibilities:
1. Select products in consultation with Owner and transmit decision to Contractor.
 2. Prepare Change Order.
- D. Contractor Responsibilities:
1. Obtain proposals from suppliers.
 2. On notification of selection by Architect/Engineer, execute purchase agreement with designated supplier.
 3. Arrange for and process product data, and samples. Arrange for delivery.
 4. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

- E. Differences in costs will be adjusted by Change Order.
 - 1. Change Order Forms: AIA G701

- F. Allowances Schedule:
 - 1. Interior Signage, Cast Bronze Letters and Plaque, include the stipulated sum of \$5,000 for purchase, delivery and installation.

1.4 SCHEDULE OF VALUES

- A. Include each item in Schedule of Values as a line item, listing amount of Allowances specified in this section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01210

SECTION 01230 -ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.
- B. Spaces for Bidders listings of values of alternates are included on the bid form.

1.2 RELATED SECTIONS

- A. Section 02520: Asphaltic Concrete Surface Course

1.3 DEFINITIONS

- A. Definition: An alternate is an amount proposed by Bidders and stated on the Bid Form for certain work that may be added to or deducted from the total Base Bid amount if the Owner decides to accept a corresponding increase or decrease in either scope of work or in products, materials, equipment, systems or installation methods described in Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the alternate into the Work. No other adjustment is made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into the project.
- B. Notification: Immediately following award of Contract, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to alternates, if any.
- C. Selection of Alternates: The Owner shall accept alternates in the numerical order in which they are listed in the Bid Form, as produces a net amount which is within the available funds.

1.5 ALTERNATES:

- A. Include as part of each alternate, miscellaneous devices, appurtenances and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.
- B. Schedule
 - 1. Add Alternate # 1: Train Slide to the tot pool
 - 2. Add Alternate # 2 : Climbing Wall
 - 3. Add Alternate # 3: Asphalt paving for the parking lot.
 - a. Grading, base course, curb and gutter, and concrete for accessible parking is included in the base bid.
 - 4. Add Alternate # 4: The Spa.
 - a. Plumbing and electrical to the spa location is a part of the Base Bid.
 - 5. Add Alternate #5: Fiber Optic Cable Connection from Raton City Hall to Aquatic Center

SECTION 01260 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes change procedures.
- B. Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

1.2 CHANGE PROCEDURES

- A. Minor Changes in the Work
 - 1. AIA Form G710
 - 2. The A/E issues Supplemental Instructions to the Contractor for minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time
- B. Construction Change Directive
 - 1. AIA Form G714
 - 2. A/E issues Construction Change Directive which describes changes in the Work and designates methods for determining changes in Contract Sum or Contract Time.
 - 3. Contractor proceeds with changes in the Work for subsequent inclusion in a Change Order
 - 4. Documentation
 - a. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.
 - b. Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - c. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
- C. Change Orders
 - 1. AIA Form G701
 - 2. Execution: A/E will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

1.3 PROPOSAL REQUESTS

- A. The A/E may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications for executing the change.
 - 1. Contractor will prepare and submit estimate within 10 days.
 - a. Include list of quantities of products required or eliminated and unit costs along with total amounts of purchases and credits to be made.
 - b. Indicate applicable taxes, delivery charges, equipment rental and amounts of trade discounts.
 - c. Include costs of labor directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor may propose changes by submitting a request for change to A/E, describing proposed change and its full effect on the Work.

1. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors.
2. Document requested substitutions in accordance with Section 01 60 00 - Product Requirements.

1.4 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
- B. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- C. Promptly enter changes in Project Record Documents.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION 01260

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Schedule of values.
- B. Applications for payment.
- C. Defect Assessment

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Submittals Schedule and Application for Payment forms with Continuation Sheets.
 - 2. Submit the Schedule of Values to A/E at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
- B. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702.
- C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance.
- D. Include in each line item, amount of Allowances specified in this section.
- E. Include in each line item, amount of Alternates specified in this section
- F. Include separately from each line item, direct proportional amount of Close-out
- G. Revise schedule to list approved Change Orders, with each Application for Payment.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by A/E and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Submit five (5) signed and notarized copies of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702.
 - 1. One copy shall include waivers of lien and similar attachments if required.
- C. Content and Format:
 - 1. Utilize Schedule of Values for listing items in Application for Payment.
 - 2. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor.
 - 3. A/E will return incomplete applications without action.
- D. Submit updated construction schedule with each Application for Payment.

- E. Payment Period: Submit at intervals stipulated in the Agreement
- F. Submit with transmittal letter as specified for Submittals in Section 01 33 00 - Submittal Procedures.
- G. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
 - 1. Current construction photographs
 - 2. Record documents for review by Owner which will be returned to Contractor.
 - 3. Affidavits attesting to off-site stored products.
 - 4. Construction progress schedules, revised and current
- H. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of Values.
 - 3. Contractor's Construction Schedule (preliminary if not final).
 - 4. Submittals Schedule (preliminary if not final).
 - 5. List of Contractor's staff assignments.
 - 6. Certificates of insurance and insurance policies.
 - 7. Performance and payment bonds.
- J. Application for Payment at Substantial Completion:
 - 1. Submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 2. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - 3. Reflect Certificates of Partial Substantial Completion issued in Application for Payment.
- K. Final Payment Application:
 - 1. Submit final Application for Payment with releases and remainder of supporting documentation , including, but not limited, to the following:
 - a. Required insurance certificates for products and completed operations
 - b. Proof that taxes, fees, and similar obligations were paid.
 - c. Updated final statement, accounting for final changes to the Contract Sum.
 - d. Final waivers from every entity involved with performance of the Work who is lawfully entitled to a lien. Evidence that claims have been settled.
 - e. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims", 2 copies
 - f. AIA Document G706A, "Contractor's Affidavit of Release of Liens", 2 copies
 - g. AIA Document G707, "Consent of Surety to Final Payment", 2 copies
 - h. Bonds, Warranties and Guarantees
 - 2. Submit complete close-out package.
 - 3. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 - 4. Notify Owner and request change over in insurance, utilities, and security; send copy of notice to A/E.
 - 5. Include Contractor's Certification that all work has been performed in compliance with the New Mexico Building Code, current edition and all of it's referenced codes including, but limited to IBC, UPC, UMC, NEC.
 - 6. Include copy of Occupancy Permit Issued by Construction Industry Division; original shall be provided to Owner.

1.4 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Architect/Engineer it is not practical to remove and replace the Work, the Architect/Engineer will direct appropriate remedy or adjust payment.
- C. At the discretion of the Architect/Engineer
 - 1. The defective Work may remain, but unit sum/price will be adjusted to new sum/price or
 - 2. Defective Work will be partially repaired to instructions of Architect/Engineer and unit sum/price will be adjusted to new sum/price
- D. Authority of Architect/Engineer to assess defects and identify payment adjustments is final.
- E. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Loading, hauling, and disposing of rejected products.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01290

SECTION 01300 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Pre-installation meetings.
- F. Requests for Interpretation (RFIs)
- G. Cutting and patching.
- H. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later where indicated on the drawings.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial and full occupancy
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

- A. Employ Registered Land Surveyor acceptable to Owner
- B. Locate and protect survey control and reference points. Promptly notify A/E of discrepancies discovered.
- C. Control datum for survey is that shown on Drawings

- D. Verify set-backs and easements; confirm drawing dimensions and elevations.
- E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- F. Maintain complete and accurate log of control and survey work as Work progresses.

1.4 PRECONSTRUCTION MEETING

- A. A/E will schedule meeting after Notice of Award
- B. Attendance Required: Owner, A/E, Funding Agency Representative, Contractor, and major subcontractors.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of Schedule of Values and Submittals Schedule.
 - 5. Designation of personnel representing parties in Contract and A/E.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
 - 8. Testing, Inspecting and Laboratory Services
 - 9. Use of premises by Owner and Contractor
 - 10. Owner's requirements and partial occupancy
 - 11. Construction facilities and controls
 - 12. Temporary utilities
 - 13. Security and housekeeping procedures.
 - 14. Procedures for maintaining record documents
- D. Minutes shall be distributed within one week after meeting to participants

1.5 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, A/E, and others as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems and Requests for information impeding planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.

13. Other business relating to Work.

E. Record minutes and distribute copies within one week after meeting to participants, with copies to A/E, Owner, and those affected by decisions made.

1.6 PRE-INSTALLATION MEETINGS

A. When required in individual specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.

B. Require attendance of parties directly affecting, or affected by, Work of specific section.

C. Notify A/E in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within one week after meeting to participants, with copies to A/E, Owner, and those affected by decisions made.

1.7 Requests for Interpretations

A. Definition: Request from Contractor seeking interpretation or clarification of the contract Documents

B. Procedure: Immediately on discovery of the need for interpretation of the contract Documents, and if not possible to request interpretation at the Progress meeting. Prepare and submit an RFI in the form specified.

1. RFIs shall originate with the Contractor. RFIs submitted by entities other than the Contractor will be returned to the Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

C. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name
2. Date
3. Name and trade of entity seeking interpretation
4. RFI number, numbered sequentially
5. Specification Section number and title and related paragraphs as appropriate
6. Drawing number and detail references, as appropriate
7. Field dimensions and conditions, as appropriate
8. Contractor's suggested solution(s). If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI
9. Attachments: include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation
 - a. Supplementary drawings prepared by the Contractor shall include dimensions, thicknesses, and details of affected materials, assemblies and attachments

D. RFI form: software generated form provided by the A/E or approved Contractor's form

1. Attachments shall be electronic files in Adobe Acrobat PDF format

E. A/E's action may include a request for additional information

- F. A/E's action which may result in a change to the Contact Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Contract Modifications Procedures Section
 - 1. If so, notify A/E in writing within 10 days of receipt of RFI response
- G. On receipt of A/E's action, update RFI log and immediately distribute the RFI response to affected parties. Review response and notify A/E within 7 days if Contractor disagrees with response.

PART 2 - PRODUCTS - Not Used.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
THE FOLLOWING PARAGRAPH IS APPROPRIATE FOR WORK IN EXISTING BUILDINGS.
- B. Submit written request in advance of cutting or altering elements affecting:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight exposed elements.
- C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other Work.
 - 2. Uncover Work to install or correct ill-timed Work.
 - 3. Remove and replace defective and non-conforming Work.
 - 4. Remove samples of installed Work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of penetrated element.
- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- K. Identify hazardous substances or conditions exposed during the Work to A/E for decision or remedy.

3.2 SPECIAL PROCEDURES

- A. Materials: As specified in product sections; match existing with new products and salvaged products for patching and extending work.

- B. Employ skilled and experienced installer to perform alteration work unless Section specifically limits work to existing installer.
- C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- E. Remove debris and abandoned items from area and from concealed spaces.
- F. Prepare surface and remove surface finishes to permit installation of new work and finishes.
- G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original or specified condition.
- I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes.
- J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to A/E for review.
- L. Where change of plane of $\frac{1}{4}$ inch or more occurs, submit recommendation for providing smooth transition; to A/E for review.
- M. Trim existing doors to clear new floor finish. Refinish trim to specified condition.
- N. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- O. Finish surfaces as specified in individual product sections.

END OF SECTION 01300

SECTION 01320 - PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Progress Schedule.
 - 2. Submittals Schedule.
 - 3. Field condition reports.
- B. The Contractor shall cooperate with the A/E and Owner in developing a Progress Schedule which realistically indicates his planned progress for the project. The Progress Schedule shall be in the form of a Bar Chart representing job activities and a superimposed Progress Curve.
- C. Use: The Contractor shall endeavor to manage the work in accordance with the scheduling indicated by the first approved Progress Chart. The intent is to promote good job management, not rigidly bind the Contractor to a planned procedure. For this reason, finish activities such as painting or laying of carpet must not be scheduled concurrently with finish plastering or door installation. The Contractor shall use special care to coordinate efforts of various subcontractors, especially mechanical and electrical, to assure proper completion of their work ahead of general finish operations.

1.2 RELATED WORK

- A. See Division 1 Section 01290 Payment Procedures for submitting the Schedule of Values.
- B. See Division 1 Section 01330 Submittal Procedures for submittal requirements.
- C. Coordinate Contractor's Progress Schedule with the Schedule of Values, Submittals Schedule, payment requests, and other required schedules and reports.

1.3 DOCUMENTATION

- A. Preliminary Progress Schedule: Within seven (7) days after receipt of Notice to Proceed, submit a Preliminary Progress Schedule covering the full term of construction for the Project. For the various categories of work shown on the bid breakdown, the schedule shall show the date of commencement of work, the percentage of schedule completion at the end of each calendar month, and the date of completion for that portion of work. This Progress Schedule shall constitute fulfillment of requirements of the General Conditions of the Contract for Construction. The Progress Schedule may include materials and equipment stored on the site.
- B. Submittals Schedule: Submit three (3) copies of schedule arranged in chronological order by dates required to maintain progress schedule. List the following information in a tabular format and include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Name of subcontractor.
 - 4. Description of the Work covered.
- C. Field Condition Reports: Submit three (3) copies at time of discovery of differing conditions.

1. Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report.
2. Submit report with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Other Forms: The Contractor may use other forms of Contract Management and reporting providing they produce supervisory assistance equal to the Progress Schedule and reporting specified herein.

1.4 PROGRESS CHART

- A. After approval by the A/E and Owner of the Preliminary Schedule, the Contractor shall prepare on vellum a Bar Chart representing the final Progress Schedule.
- B. Reporting: Each month with the Request of Payment, submit a copy of the final Progress Chart marked to show actual percentage of completion for each category of work, as well as the aggregate percentage of completion.
- C. Behind Schedule Progress: If the actual progress curve at any time falls more than 10% behind the proposed curve, the Contractor shall promptly take the steps necessary to get the work back on schedule. It is emphasized that the purpose of this scheduling is to assure orderly management of the project and the pushing of finish activities into areas where rough activities are not completed shall not be tolerated. Neither shall last minute rush scheduling be permitted to enable the Contractor to finish on time if it involves poor construction procedures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01320

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. See Division 1:
 - 1. Section 01320 Progress Schedule for submitting schedules and reports, including Contractor's Construction Progress Schedule and the Submittals Schedule.
 - 2. Section 01450 Quality Control for submitting test and inspection reports.
 - 3. Section 01600 Product Requirements for Substitution Procedures.
 - 4. Section 01700 Execution and Closeout Requirements for submitting Record Documents and operation and maintenance manuals.

1.2 WORK RELATED SUBMITTALS

- A. Work-related submittals of this section are categorized for convenience as follows:
 - 1. Shop drawings include specially-prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to a range of similar projects.
 - 2. Product data include standard printed information on materials, products and systems; not specially-prepared for this project, other than the designation of selections from among available choices printed therein.
 - 3. Samples include both fabricated and unfabricated physical examples of materials, products and units of work; both as complete units and as smaller portions of units of work; either from limited visual inspection or (where indicated) for more detailed testing and analysis.
 - a. Mock-ups are a special form of samples, which are too large or otherwise inconvenient for handling in specified manner for transmittal of sample submittals.
- B. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, and similar information, devices and materials applicable to the work and not processed as shop drawings, product data, or samples.
- C. Individual submittal requirements are specified in applicable sections for each unit of work.

1.3 SUBMITTAL GENERAL REQUIREMENTS

- A. Submittals Schedule: Comply with requirements of Division 1 Section "Progress Schedule" for list of submittals and time requirements for scheduled performance of related construction activities.
- B. Coordination and Sequencing: Coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for same work, and for interfacing units of work, so that one will not be delayed for coordination of A/E's review with another.

- C. Processing Time: Allow enough time for submittal review including time for resubmittals. Time for review shall commence on A/E's receipt of submittal.

1.4 ACTION SUBMITTALS

- A. Preparation of Submittals:
1. Execute and attach to each submittal, "CONTRACTOR SUBMITTAL FORM" which identifies project, date, Contractor, subcontractor, submittal name and number.
 2. Show Contractor's executed review and approval marking.
 3. Do not combine items from different specification sections in submittal, unless called for in specifications.
 4. At time of submission, note in writing, highlight, circle or otherwise identify any deviations in submittal from Contract Documents.
 5. Submittals which are received from sources other than through Contractor's office will be returned by A/E "without action."
 6. Begin no fabrication or work that requires submittals until return of submittals with Architect's final review.
- B. Shop Drawings: Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated), with name of preparer indicated (firm name). Show dimensions and note which are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards, and special coordination requirements. Do not allow shop drawing copies without appropriate final "Action" markings by Architect/Engineer to be used in connection with the work.
1. Submittal: Six copies shall be submitted to the Architect and three will be returned to the Contractor.
- C. Product Data: Collect required data into one submittal for each unit of work or system; and mark each copy to show which choices and options are applicable to project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one set of product data (for each submittal) at project site, available for reference by Architect/Engineer and others.
1. Submittals: Do not submit product data, or allow its use on the project, until submittal has been returned with the Architect's final review. Six copies shall be submitted to the Architect and three will be returned to the Contractor.
 2. Installer's Copy: Do not proceed with installation of materials, products or systems until final copy of applicable product data is in possession of Installer.
- D. Samples: Provide units identical with final condition of proposed materials or products for the work. Include "range" samples (not less than 3 units) where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where Architect's/Engineer's selection is required. Prepare samples to match Architect's/Engineer's sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture, and "kind" by Architect/Engineer. Architect/Engineer will not "test" samples (except as otherwise indicated) for compliance with other requirements, which are therefore the exclusive responsibility of Contractor.
- E. Mock-Ups: Mock-ups and similar samples specified in individual work sections recognized as a special type of sample. Comply with requirements for "samples" to greatest extent possible, and process transmittal forms to provide a record of activity.

1.5 SPECIFIC-CATEGORY SUBMITTALS

- A. General: Except as otherwise indicated in individual work sections, comply with requirements specified herein for each indicated category of submittal. Provide and process intermediate submittals, where required between initial and final, similar to initial submittals.
- B. Inspection and Test Reports: Classify each as either "shop drawing" or "product data", depending upon whether report is uniquely prepared for project or a standard publication of workmanship control testing at point of production; process accordingly.
- C. Warranties: Refer to "Products" section for specific general requirements on warranties, product/workmanship bonds, and maintenance agreements. In addition to copies desired for Contractor's use, furnish 2 executed copies, except furnish 2 additional (conformed) copies where required for maintenance manuals.
- D. Closeout Submittals: Refer to individual work sections and to "closeout" sections for specific requirements on submittal of closeout information, materials, tools, and similar items.
 - 1. Materials and Tools: Refer to individual work sections for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.
- E. General Distribution: Provide additional distribution of submittals (not included in foregoing copy submittal requirements) to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for proper performance of the work. Include such additional copies in transmittal to Architect/Engineer where required to receive "Action" marking before final distribution. Record distributions on transmittal forms.

1.6 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to A/E.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1.7 A/E'S REVIEW

- A. General: A/E will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. A/E will review submittals and where possible return within 2 weeks of receipt. Where submittal must be held for coordination, Contractor will be so advised by A/E without delay.
- C. A/E will affix stamp and initials or signature, and indicate requirements for resubmittal or review of submittal.
- D. A/E will return submittals to Contractor for distribution or for resubmission.
- E. Submittal Review Stamps:
 - 1. "Reviewed and Not Accepted" - resubmittal required.

2. "Reviewed and Noted" - resubmittal not required provided Contractor concurs with, accepts, and complies with Architect's/Engineer's notes.
 3. "Reviewed"
- F. A/E review does not constitute acceptance or responsibility for accuracy or dimensions, nor shall it relieve the Contractor from meeting any requirements of the Contract Documents, nor shall it constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer.
- G. A/E to return submittals with only cursory review when it becomes apparent the submittals are not acceptable, and/or incomplete.
- H. Payment and Time for Review of Excessive Submittals After First Resubmittal:
1. Include Contractor's statement to A/E that all costs shall be paid by the Contractor and executed by Change Order for all A/E's review time and costs at A/E's standard billing rates.
 2. Submittals will be reviewed by A/E at convenience of the A/E.
 3. Delays caused by the need for resubmittal shall not constitute basis for claim.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01330

CONTRACTOR SUBMITTAL FORM

Project:	Contractor's Submittal No.:
	Date:
	Product Description:
CONTRACTOR:	Dates of any previous submissions:
Supplier:	Manufacturer:
Specification No.:	Drawing Nos.:
Are there any deviations to the contract documents? <input type="checkbox"/> No <input type="checkbox"/> Yes (Explain and Identify:)	
<p>CONTRACTOR'S CERTIFICATION: This submittal has been reviewed by the Contractor in compliance with Section 01 33 00 of the CONTRACT DOCUMENTS' SPECIFICATIONS. Any deviations to the CONTRACT DOCUMENTS have been identified above and submitted in compliance with Section 01 60 00. If this is a re-submittal, any changes other than those specifically called for by the A/E on previous submittals are specifically identified on the sheet(s) directly following this form.</p>	
Signed	Date:

MOLZEN-CORBIN'S ACTION

Date Received:	No. Copies Received:
<input type="checkbox"/> REVIEWED for general conformity with DRAWINGS and SPECIFICATIONS. Quantities shown not verified. CONTRACTOR'S full responsibility is in no way relieved by this action.	
<input type="checkbox"/> REVIEWED AND NOTED for general conformity with DRAWINGS and SPECIFICATIONS. Quantities shown not verified. CONTRACTOR'S full responsibility is in no way relieved by this action.	
<input type="checkbox"/> REVIEWED AND NOT ACCEPTED. Not in conformity with DRAWINGS and SPECIFICATIONS.	
<input type="checkbox"/> NOT REVIEWED	
By:	Date:
Date Returned:	No. Copies Returned:
A/E'S COMMENTS, IF ANY:	
A/E'S ATTACHMENTS, IF ANY:	

Note: DO NOT combine items from different specification sections in submittal, unless called for in specification

MOLZEN-CORBIN & Associates
2701 Miles Rd. SE
Albuquerque, NM 87106



SECTION 01420 - REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Back-Up: "Back-up" as relating to any item, product, or documents within the scope of this Contract, shall mean the total supporting and substantiating data which forms the basis of the summary as it relates to products, means, methods, costs, certificates, and similar items. Back-up shall include pertinent data required to support the summary including, but not necessarily limited to, the following:
 - 1. Technical data, reports, and certifications.
 - 2. Costs, both materials and labor, direct and indirect.
 - 3. Manufacturer's recommendations.
 - 4. Means and methods.
 - 5. History.
 - 6. Samples.
 - 7. Comparative analysis.
 - 8. Testing laboratory reports, tests, and recommendations.
 - 9. Code authority approvals and authorizations.
 - 10. Justification.
- C. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- D. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- E. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- F. "Provide": Furnish and install, complete and ready for the intended use.
- G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to A/E for a decision before proceeding.

- D. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to A/E for a decision before proceeding.
- E. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list:

AA	Aluminum Association
AAMA	American Architectural Manufacturing Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADAAG	Americans with Disabilities Accessibility Act Guidelines
ADC	Air Diffusion Council
AHA	American Hardboard Association
AI	Asphalt Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APA	American Plywood Association
APWA	American Public Works Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWWA	American Water Works Association

AWS	American Welding Society
CBM	Certified Ballast Manufacturers
CFR	Code of Federal Regulations
CPSC	Consumer products Safety Commission
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
DHI	Door and Hardware Institute
EI	Edison Electric Institute
ETL	Electrical Testing Laboratories
FM	Factory Mutual
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS)
GA	Gypsum Association
GANA	Glass Association of North America
HMMA	Hollow Metal Manufacturers Association
HPVA	Hardwood Plywood and Veneer Association
IBC	International Building Code
ICEA	Insulated Cable Engineers Association
IEBC	International Existing Building Code
IEEE	Institute of Electrical and Electronics Engineers
IFC	International Fire Code
ISA	Instrument Society of America
MIL	Military Specification Naval Publications and Forms Center
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NEC	National Electric Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electric Safety Code

NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NMBC	New Mexico Building Code Code Regulations Licensing Department Construction Industries Divisions
NRCA	National Roofing Contractors Association
NWWDA	National Wood Window and Door Association
OSHA	Occupational Safety & Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	Product Standard US Department of Commerce
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SIGMA	Sealed Insulating Glass Manufacturer's Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association, Inc.
SSPC	Steel Structure Painting Council
TMS	The Masonry Society
UL	Underwriters' Laboratories, Inc.
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code International Association of Plumbing/Mechanical Officials
WWPA	Western Wood Products Association

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01420

SECTION 01430 - QUALITY ASSURANCE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provisions for quality control and assurance relating to all workmanship and craftsmanship applied to all work executed in the performance of the Contract.
- B. Related Work Described Elsewhere: Provisions of trade associations, manufacturer's printed instructions, recommendations, methods, and criteria for application and installation of systems and assemblies, various technical sections of these specifications, the Drawings, and Reference Standards Section.
 - 1. Provisions of all work furnished under this Contract and installed under this Contract.
 - 2. Provisions of all work installed under this Contract furnished by others.
- C. Definitions: The scope of this section applies to all technical sections of these specifications and the Drawings which deal with all materials installed in the Work including, but not necessarily limited to, specific materials, parts, assemblies, components, systems, and products, their interface with one to another, including total compatibility with each other, their design, standard of quality, installation, and finished appearance and functional ability at the conclusion of the Work.
 - 1. Assembly: A collection of things brought together to a sum composed of more than one part.
 - 2. Component: As in an assembly or the whole it is a constituent part.
 - 3. Design: A specific form and construction intended for a specific purpose, comprised of one or more parts which when completely assembled, installed or located in final situ, will reflect the original concept of the ultimate appearance of the whole.
 - 4. Quality: That which distinguishes or sets apart one thing from another to a degree or standard of excellence.
 - 5. Workmanship (Craftsmanship): The quality of work done on something expressing competence in the arts or skills indicative of being performed by a workman who practices a trade or handicraft, and applies special techniques and skills to produce a given work.
 - a. Shop Workmanship: Fabrication of parts and component sections shall exhibit all the specified, detailed, and shop drawing approval (design) characteristics of similar mass produced products.
 - b. Concealed Workmanship: Installation of concealed parts and components shall be performed to the highest standards possible to produce equal or greater accuracy than specified and to ensure compliance with codes, regulations, and the design of the Work.
 - c. Exposed Workmanship: As used herein, workmanship means "good" as opposed to "poor." Good workmanship refers to in part precise layout and measurements, accurate cuts, tight fits, secure fastening, perfection of surfaces, levels, planes, and interfaces, ultimately reflecting an appearance to the eye (from five feet away on vertical or horizontal plane surfaces) as being smooth, rough or textured in its plane without blemish, spots or inconsistencies.
- D. Work of This Section Affected By: All provisions of the General Conditions and technical sections of these specifications, codes, regulations, and referenced standards appearing throughout the Contract Documents.

1.2 INCORPORATED DOCUMENTS

- A. Published specifications, standards, recommended methods of trade, industry, and governmental organizations apply to the work of this and all other technical sections of these specifications where cited by abbreviations.

1.3 QUALITY ASSURANCE

- A. In addition to complying with all pertinent codes and regulations, comply with the applicable quality provisions of trade and industry, their recommendations on materials, methods and workmanship and the design of the Work and approved Shop Drawings.
- B. Qualifications of Personnel:
1. Project Superintendent: The superintendence of the General Contractor for the total overall Work shall be administered by one qualified person who is thoroughly trained and experienced in the duties of a Project Superintendent and who is familiar with the specified requirements and methods to be used in the scheduling, supervision, performance, and execution of the Work and his qualifications may be subject to review and approval by the Architect.
 2. Subcontractors: The superintendence of all trades involved in work of this project shall be administered, supervised, and directed by at least one qualified journeyman foreman who is thoroughly trained and skilled in the arts generic to his trade and all such qualifications may be subject to review and approval by the Architect.
 3. Workmen: All workmen engaged in the performance of work comprising a part of the total Work of this Contract shall be adequate in number, thoroughly trained and experienced in the installation of the specified and selected products and who are completely familiar with the requirements of their respective work and this Work.
 4. Apprentice: All apprentice personnel shall, in the performance of their respective Work, be supervised and directed in their duties under the competent supervision and direction of experienced journeymen experienced and skilled in their trade.
- C. Qualifications of Manufacturers: Products used in the work of this project shall be produced by recognized manufacturers regularly engaged in the manufacturing of such and similar products with a history of successful production of products specified in the various sections of these specifications and as otherwise approved by the Architect.
1. In the use of equal or similar manufactured products proposed for inclusion into the Work, comply with the provisions of Submittal Section.
- D. Qualifications of Fabricators, Suppliers, and Personnel: Fabricators, erectors, suppliers, installers, and applicators shall have not less than five years continuous experience in the execution of their respective duties and their qualifications may be subject for review and approval by the Architect.
- E. Qualifications of Licensed Applicators: Applicators of specific systems, licensed by a manufacturer or company of such products, shall be qualified in every respect required by the manufacturer or company to the extent permitting the issuance of all required guarantees, warranties, and certificates of compliance to the approval of the Architect.

1.4 SUBMITTALS

- A. Within ten (10) days following the execution of the Contract, submit the personal work history of the Project Superintendent proposed to be assigned to the project to its final conclusion.
1. Submittal may be in the form of a letter or standard employment "Job Application" covering the person's last five (5) years work history and contact source, names, and telephone numbers for use in verification of qualifications and recommendations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

- A. Prior to any work being performed in the execution of the Contract, all personnel who supervise, or otherwise direct the scope of their respective work, shall become thoroughly familiar with surface conditions affecting their work, the interface requirements of all other trades whose work affects their work, and become completely knowledgeable with the specified materials and methods needed for the proper coordination and execution of the work.

3.2 WORKMANSHIP - CRAFTSMANSHIP

- A. Workmanship (craftsmanship) as used and to be executed herein shall not necessarily reflect the theme of "Common Practice," but more precisely reflect the project concept and design, reflected in the Contract Documents constructed to a degree of excellence, aesthetically appealing to the eye, visibly neat, and unblemished.

END OF SECTION 01430

SECTION 01450 - QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Quality Control And Control Of Installation
- B. Tolerances
- C. Testing And Laboratory Services
 - 1. Provisions of cooperation with the selected testing laboratory and all others responsible for testing and inspection of the Work.
 - 2. Requirements for testing may be described in various other sections of these specifications.
 - 3. Where no testing requirements are described, but the Owner decides that testing is required, the Owner may direct that such testing be performed under current standards for testing. Payment for such testing will be made as described in this section.
 - 4. Contractor shall select a testing laboratory subject to the approval of the Owner.
- D. Special Inspection Services
 - 1. Provide special inspections as specified to be furnished by the Contractor in this section and/or elsewhere in these specifications.
 - 2. Requirements for inspections may be described in various other sections of these specifications.
 - 3. Contractor shall select an inspection agency subject to the approval of the Owner.
- E. Manufacturers' Field Services
 - 1. Requirements for manufacturers' field services may be described in various other sections of these specifications.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 TESTING AND INSPECTION SERVICES

- A. Codes and Standards: Testing and inspections, when required, will be in accordance with pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.
- B. Employ and pay for services of an independent testing agency or laboratory acceptable to Owner to perform specified testing and inspecting.
 - 1. Prior to start of Work, submit testing agency name, address, and telephone number
 - 2. Qualifications of testing agency or laboratory: The testing agency or laboratory will be qualified to the Owner's approval in accordance with ASTM E-329.
- C. Agency Responsibilities:
 - 1. Cooperate with A/E and Contractor in performance of duties.
 - 2. Provide qualified personnel to perform required tests and inspections.
 - 3. Notify A/E and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 4. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 5. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 6. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 - 7. Do not perform any duties of Contractor.
- D. Agency Reports:
 - 1. Prepare and submit certified written reports that include the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making tests and inspections.
 - f. Description of the Work and test and inspection method.
 - g. Identification of product and Specification Section.
 - h. Complete test or inspection data.
 - i. Test and inspection results and an interpretation of test results.
 - j. Ambient conditions at time of sample taking and testing and inspecting.
 - k. Name and signature of laboratory inspector.
 - l. Recommendations on retesting and reinspecting.
 - 2. Promptly process and distribute required copies of reports and related instructions to ensure necessary retesting and replacement of materials with the least possible delay in progress of the Work.
- E. Limits On Testing Authority:
 - 1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency or laboratory may not approve or accept any portion of the Work.
 - 3. Agency or laboratory may not assume duties of Contractor.
 - 4. Agency or laboratory has no authority to stop the Work.

- F. Contractor Responsibilities: Cooperate with agencies performing required tests, inspections, and similar quality-control services. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Preliminary design mix proposed for use for material mixes that require control by testing agency.

1.5 PAYMENT FOR TESTING

- A. The Contractor will pay for initial testing and inspections services required by these specifications, building code or regulatory agencies.
- B. When there is work which the Owner requires tested and inspected in addition to specified and required tests, the Contractor will pay for the tests if the work does not comply with required standard and specifications. The Owner will pay for the tests if the work does comply with the required standards and specifications.
- C. Retesting and Re-inspecting: When initial reports indicate non-compliance with the Contract Documents, all subsequent retesting and re-inspecting occasioned by the non-compliance shall be performed by the same agency and costs thereof will be paid by the Contractor at no additional cost to the Owner.

1.6 CODE COMPLIANCE TESTING AND INSPECTING

- A. Inspections and tests required by codes, ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.7 CONTRACTOR'S CONVENIENCE TESTING AND INSPECTING

- A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.8 INSPECTION BY OWNER'S PERSONNEL

- A. From time to time, personnel in the employ of the Owner may inspect the Work where the work is in progress, but shall have no authority to direct the Contractor or request changes in the Work except through the Architect/Engineer.

1.9 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, warranty inspections, start-up of equipment, and test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TAKING SPECIMENS

- A. Specimens for testing and samples, unless otherwise provided in the Contract documents, will be taken by the testing personnel. Sampling equipment and personnel will be provided by the testing laboratory. Deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

3.2 SCHEDULES FOR TESTING AND INSPECTING

- A. By advance discussion with the selected agency, determine the time required for the agency to perform its tests and inspection and to issue each of its findings.
- B. Provide required time within the construction schedule.
- C. When changes of construction schedule are necessary during construction, coordinate such changes of schedule with the agency as required.
- D. When the agency is ready to test or inspect according to the established schedule, but is prevented from performing its duties due to incompleteness of the Work, all extra charges attributable to the delay shall be backcharged to the Contractor and shall not be borne by the Owner.

3.3 ALTERNATIVE INSPECTION PROCEDURE

- A. The A/E shall have the right to require alternative inspection procedures other than as specified when, in the A/E's judgment, other inspections are required to demonstrate compliance with the contract requirements. Costs of such alternative inspections will be borne by the Owner if products are found to comply; otherwise, costs shall be borne by the Contractor.

END OF SECTION 01450

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Temporary Utilities
- B. Construction Facilities
- C. Temporary Controls
- D. Removal Of Utilities, Facilities, And Controls

1.2 CONDITIONS OF USE:

- A. The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
 - 1. Keep temporary services and facilities clean and neat.
 - 2. Minimize waste and abuse; limit availability of temporary facilities to essential and intended uses.
 - 3. Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
 - 4. Relocate temporary services and facilities as required by progress of the Work.

1.3 TEMPORARY UTILITIES

- A. Types of temporary services required may include, but not be limited to water service, sewer and drainage, sanitary facilities, heating and cooling, ventilation and humidity control, electrical power, electrical distribution, lighting, surface drainage, and telephones.
 - 1. Standards: Comply with ANSI A10.6, NEC's "Temporary Electrical Facilities," and NFPA 241
- B. Water Service:
 - 1. Potable Water Drinking-Water Fixtures: Drinking-water fountains or Containerized, tap-dispenser, bottled-water, drinking-water units, including paper cup supply.
 - 2. Provide rubber hoses as necessary to serve Project site. Where non-potable water is used, mark each outlet with adequate health-hazard warning signs.
- C. Sewers and Drainage:
 - 1. If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. Connect temporary sewers to system as directed by sewer department officials.
 - 2. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities.
 - 3. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
 - 4. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
 - 5. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
 - 6. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Single-occupant self-contained toilet units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material, including hand-sanitizing capability.
 2. Shield toilets to ensure privacy.
 3. When toilets for public use are included in the Work, provide accessible unit located on an accessible route and provide separate facilities for males and females.
 4. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
- E. Heating and Cooling
1. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
 2. Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity.
 3. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control:
1. Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity.
 2. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.
 3. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. Electrical Power and Distribution System
1. General: Where possible, engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
 2. Electric Power and Distribution Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
 - a. Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.
 - b. Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
 - c. Receptacles: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light and adequate for connection of power tools and equipment.
 - d. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
 3. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
 - a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

- b. Provide one 100-W incandescent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
- c. Provide one 100-W incandescent lamp every 50 feet in traffic areas.
- d. Provide one 100-W incandescent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.
- e. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

- H. Use Charges: Cost or use charges for temporary utilities are not chargeable to Owner or A/E and shall be included in the Contract Sum except as follows:
- 1. Water Service: Use water from Owner's existing water system without metering and without payment of use charges.

1.4 CONSTRUCTION FACILITIES

- A. Types of temporary support and construction facilities required may include, but may not be limited to roads, dewatering equipment, project identification and temporary signs, waste disposal facilities, field office, storage areas and sheds, lifts and hoists, stairs, accessways, fire-rated exitways.
- B. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- C. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- D. Provide access, ramps, stairs, ladders and similar temporary access elements as required to perform the work and facilitate its inspection during installation.
 - 1. Comply with inspection requests from Authorities having Jurisdiction.
 - 2. When permanent stairs are available for access during construction, finishes shall be covered and protected from damage. Damage to existing conditions will be repaired to the owner's satisfaction, prior to Project Completion
 - 3. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access. Coordinate location with Owner.
 - 4. Maintain support facilities until Substantial Completion. Remove immediately after Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- E. Temporary Roads: Construct and maintain temporary trafficways adequate to support loads and to withstand exposure to traffic during construction period.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- F. Dewatering Equipment and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities, and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
 - 1. Project Identification and Temporary Signs
 - 2. Project identification sign
 - 3. Engage an experienced sign painter to apply graphics.
 - 4. Sign size: 4' x 8"
 - 5. Sign material: 0.75 inch thick exterior grade plywood.
 - 6. Supports: Two, 4" x 4" x 8' supports, sign bolted to supports.
 - 7. Color: Royal Blue background, white lettering.
 - 8. Lettering: Minimum 2" height.
 - 9. Prepare temporary signs to provide directional information to construction personnel and visitors.

10. Install where directed to inform public and persons seeking entrance to Project.
11. Do not permit installation of unauthorized signs
12. Maintain signs and supports in a neat, clean condition; repair damages to structure, framing, or sign.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

H. Field Offices: With lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading. Provide space for Project meetings, with table and chairs.

I. Storage Areas And Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section

J. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

K. Stairs

1. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
2. Cover finished permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.
3. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
4. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

1.5 TEMPORARY CONTROLS

A. Types of temporary security and protection controls required may include, but not be limited to, environmental protection - erosion and sediment, stormwater, dust, noise and pollution control; pest and rodent control; tree and plant protection; site enclosure fencing, security enclosure and lockup, barricades, warning signs and lights; weather protection enclosures; and fire protection.

B. Environmental protection: provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Erosion And Sediment Control

1. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
2. Minimize surface area of bare soil exposed at one time.
3. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.
4. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
5. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

D. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

- E. Dust Control
 - 1. Execute Work by methods to minimize raising dust from construction operations.
 - 2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
- F. Noise Control:
 - 1. Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 2. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.
- G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with pollution and environmental control requirements of authorities having jurisdiction
- H. Pest and Rodent Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- I. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.
- J. Site Enclosure Fence: Before construction operations begin install enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
 - 1. Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts.
- K. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- L. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
 - 1. Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved in writing by A/E and Owner. Provide materials suitable for use intended.
 - 2. Provide temporary weathertight enclosure for building exterior to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons.
 - a. Provide access doors with self-closing hardware and locks.
 - b. Gypsum Board: 5/8" thick Type X for fire-rated areas
 - 3. Provide temporary exitways as required by the Fire Marshall or Authority having jurisdiction.
 - 4. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures.
 - 5. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

6. Close vertical openings of 25 sq.ft. or less with plywood or similar materials. Close horizontal openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 - a. Lumber and Plywood: Comply with requirements in Division 6 Section.
7. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

N. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide portable, UL rated-fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
2. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
3. Store combustible materials in containers in fire-safe locations.
4. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting.
5. Prohibit smoking in occupied buildings and hazardous fire-exposure areas.
6. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

1.6 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. At earliest feasible time, when acceptable to Owner, change over from use of temporary utility to use of permanent service.
- B. Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."
- C. Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01500

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for selecting products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. See Division 1 Section 01700 Execution and Closeout Requirements for submitting warranties for contract closeout.
- C. See Specification Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

- A. For the purposes of this Specification Section, the terms "material and equipment" and "products" have the same meaning and are used interchangeably.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes, proposed by Contractor, in products, materials, equipment, and methods of construction from those required by the Contract Documents.
- C. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

1.3 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on project, product selected shall be compatible with other products incorporated into the Project, even if other products were also options.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.

1.4 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.5 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground
- E. Provide bonded and insured off-site storage and protection when site does not permit on-site storage or protection and when permitted by the Owner.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.6 PROTECTION AFTER INSTALLATION:

- A. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove coverings when no longer needed.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections 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. Submittal Time: Comply with requirements in Division 1 Section Execution and Closeout Requirements

1.8 PRODUCT OPTIONS:

- A. General Product Requirements:
 - 1. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 - 2. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 3. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

4. Limit selection to products with warranties not in conflict with requirements of the Contract Documents.
5. Where products are accompanied by the term "as selected," A/E will make selection.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, A/E will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, A/E will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
6. Where products are accompanied by the term "match sample," sample to be matched is sample provided by A/E.
7. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
8. Comply with size, make, type and quality specified, or as specifically approved in writing by the A/E.

B. Manufactured and Fabricated Products:

1. Design, fabricate and assemble in accordance with the referenced engineering and shop practices.
2. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
3. Two or more items of the same kind shall be identical, by the same manufacturer.
4. Products shall be suitable for service conditions.
5. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically requested by the Contractor and favorably reviewed by the A/E.
6. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

C. Selection Criteria:

1. Products Specified Only By Reference Standard: select any product meeting that standard.
2. Products Specified By Naming Several Products Or Manufacturers: select any one of the products or manufacturers named, which complies with the specifications; no options or substitutions.
3. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.
 - a. Other manufacturers' products may be accepted, provided sufficient information is submitted to allow the A/E to determine that products proposed as substitutions are equivalent to those named.
 - b. Contractor must submit written request for substitutions for any product or manufacturer not specifically named.
 - c. Proof of product equivalency is the Contractor's responsibility.
 - d. Architect and the named manufacturer (when manufacturer desires) shall be the judge of the acceptability of the proposed product substitution
4. Products specified by naming only one product and manufacturer: provide specified product

1.9 PRODUCT SUBSTITUTION

- A. Submit written requests for Product Substitution after award of the Contract for Construction and within 30 days after Notice to Proceed.
- B. Substitutions shall be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that Contractor:
 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.

2. Will provide same warranty for Substitution as for specified product.
 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure: Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles. Submit a separate request for each product, supported with complete data, with drawings and samples as appropriate, including:
1. Comparison of the qualities of the proposed substitution with that specified.
 2. Changes required in other elements of the work because of the substitution.
 3. Effect on the construction schedule.
 4. Cost data comparing the proposed substitution with the product specified. Include cost of changes required in other elements affected by these substitutions in addition to the cost of the product.
 5. Any required license fees or royalties.
 6. Availability of maintenance service, and source of replacement materials.
- G. A/E will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

1.10 REUSE OF EXISTING MATERIAL

- A. Except as specifically indicated or specified, materials and equipment removed from an existing structure shall not be used in the completed Work.
- B. For material and equipment specifically indicated or specified to be reused in the Work:
1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
 2. Arrange for transportation, storage, and handling of products which require off-site storage, restoration or renovation. Include all costs for such work in the Bid.

1.11 MANUFACTURER'S INSTRUCTIONS

- A. When Contract Documents require installation of work to comply with manufacturer's instructions, such instructions must be included with:
1. Shop drawing and/or product data submitted if an operation and maintenance manual is not required.
 2. Operation and maintenance data if required.
- B. Handle, install, connect, clean, condition, and adjust products in strict accordance with such instructions and in conformity with specified requirements.
1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect for further instructions.
 2. Do not proceed with work without clear instructions.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01600

SECTION 01700 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Progress cleaning
 - 2. Protecting installed construction
 - 3. Final cleaning
 - 4. Closeout procedures
 - 5. Starting of systems
 - 6. Demonstration and instructions.
 - 7. Testing, adjusting and balancing
 - 8. Project record documents
 - 9. Operation and maintenance data
 - 10. Spare parts and maintenance products
 - 11. Product warranties and product bonds.
 - 12. Maintenance service.
- B. See Division 1 Section 01290 Payment Procedures for requirements for Applications for Payment for Substantial and Final Completion.

1.2 DEFINITIONS

- A. Closeout: Closeout is hereby defined to include general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the work.

1.3 PROGRESS CLEANING

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.
- B. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- C. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- D. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

1.4 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.5 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment. Employ experienced workers or professional cleaners for final cleaning.
 - 1. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program.
 - 2. Comply with manufacturer's written instructions.
- B. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces
- C. Replace filters of operating equipment
- D. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - 1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - 2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - 3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 4. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - 5. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - 6. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - 7. Sweep concrete floors broom-clean in unoccupied spaces.
 - 8. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - 9. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - 10. Remove labels that are not permanent.
 - 11. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - b. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - c. Replace parts subject to unusual operating conditions.
 - d. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - e. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - f. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

- g. Leave Project clean and ready for occupancy.
- E. Comply with Safety Standards for Cleaning:
 - 1. Do not burn waste materials.
 - 2. Do not bury debris or excess materials on Owner's property.
 - 3. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
 - 4. Remove waste materials from Project site and dispose of lawfully.
- F. Removal of Protection: Except as otherwise indicated or requested by A/E/Engineer, remove temporary protection devices and facilities which were installed during course of the work.
- G. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site, or bury debris or excess materials on Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from site and dispose of in a lawful manner.
- H. Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these to Owner's best advantage as directed.

1.6 CLOSEOUT PROCEDURES

A. Substantial Completion

- 1. Preliminary Procedures: Prior to requesting A/E's inspection for certification of substantial completion (for either entire work or portions thereof), complete the following and list known exceptions in request:
 - a. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - b. Advise Owner of pending insurance change-over requirements.
 - c. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
 - d. Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including occupancy permits, operating certificates, and similar releases.
 - e. Prepare and submit Project Record Documents, operation and maintenance manuals, and similar final record information.
 - f. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - g. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - h. Complete startup testing of systems.
 - i. Submit test/adjust/balance records.
 - j. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - k. Advise Owner of changeover in heat and other utilities.
 - l. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - m. Complete final cleaning requirements, including touchup painting.
 - n. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- 2. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, A/E will either proceed with inspection or notify Contractor of unfulfilled requirements. A/E will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by A/E, that must be completed or corrected before certificate will be issued.
 - a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

- b. Results of completed inspection will form the basis of requirements for Final Completion.

B. Final Completion

1. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 - a. Submit a final Application for Payment according to Division 1 Section "Payment Procedures." Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - b. Submit updated final statement, accounting for additional (final) changes to Contract Sum.
 - c. Submit certified copy of A/E's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by A/E. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - d. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - e. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 - f. Submit consent of surety and Contractors affidavit of Release of Liens (AIA Document G706A).
2. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, A/E will either proceed with inspection or notify Contractor of unfulfilled requirements. A/E will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

C. List Of Incomplete Items (Punch List)

1. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction:
 - a. Organize list of spaces in sequential order, starting with exterior areas first then proceeding from lowest to highest room number.
 - b. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.7 STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Owner seven days prior to start-up of each item.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision in accordance with manufacturers' instructions.

1.8 DEMONSTRATION AND INSTRUCTIONS

- A. Schedule demonstration of operation and maintenance of products with Owner and conduct training with Owner's personnel two weeks prior to date of Substantial Completion

1. Provide instructors experienced in operation and maintenance procedures.
 2. Provide instruction at mutually agreed-on times.
- B. For equipment or systems requiring seasonal operation, perform demonstration for all seasons
- C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. Required instruction time for each item of equipment and system is specified in individual sections.

1.9 TESTING, ADJUSTING AND BALANCING

- A. Independent firm will perform testing, balancing and adjusting services specified in other sections
- B. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.10 PROJECT RECORD DOCUMENTS

- A. General:
1. Do not use Project Record Documents for construction purposes. Store Record Documents and Samples in the field office apart from the Contract Documents used for construction.
 2. Protect Project Record Documents from deterioration and loss.
 3. Provide access to Project Record Documents for A/E reference during normal working hours.
 4. Maintain one (1) copy of each document type during construction period for Project Record Document purposes.
 5. Post changes and modifications to Project Record Documents on a weekly basis.
- B. Record Drawings: Maintain and submit one (1) set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - c. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 - 1) Clearly describe the change by note and by graphic line, as required.
 - 2) Date all entries.
 - 3) Call attention to the entry by a "cloud" around the area or areas affected.
 - 4) In the event of overlapping changes, different colors may be used for each of the changes.
 - d. Where changes are caused by Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification, clearly indicate the change by note in ink, colored pencil, or rubber stamp.

- e. Where changes are caused by Contractor-originated proposals approved by the A/E, including inadvertent errors by the Contractor which have been accepted by the A/E, clearly indicate the change by note in erasable colored pencil.
 - f. Because design of future modifications to the facility may require accurate information as to the final physical arrangement of items which were originally drawn schematically on the Drawings convert schematic layouts to show its final physical arrangement
 - g. Show on the job set of Record Drawings, by dimension accurate to within 1 inch, the centerline of each run of items described in the preceding paragraph. Clearly identify the item by accurate note such as "3" cast iron water main", etc. Show, by symbol or note, the vertical control elevation of the item. Make all identification sufficiently descriptive that it may be related reliably to the specifications.
 - h. The A/E may waive the requirements for conversion of schematic data where, in the A/E's judgment, such conversion serves no beneficial purpose. A/E will issue a written waiver when this applies
 - i. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one (1) copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
- 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Note related Change Orders and Record Drawings, where applicable.
- D. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Include the following:
- 1. Addenda.
 - 2. Change Orders and other modifications to the Contract.
 - 3. Reviewed Shop Drawings, Product Data, and Samples.
 - 4. Manufacturer's instruction for assembly, installation, and adjusting.
 - 5. Test and Inspection Reports
 - 6. Design Mix Records
 - 7. Inspections by Authority having Jurisdiction

1.11 OPERATION AND MAINTENANCE MANUALS

- A. General:
- 1. Submit two (2) copies of each manual in final form at least 10 days before final inspection. A/E will return copy with comments
 - 2. Correct or modify each manual to comply with comments. Submit two (2) copies of each corrected manual within 10 days of receipt of A/E's comments.
- B. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
- 1. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
- C. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.
1. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - a. Subject matter included in manual.
 - b. Name and address of Project.
 - c. Name and address of Owner.
 - d. Date of submittal.
 - e. Name, address, and telephone number of Contractor.
 - f. Name and address of A/E.
 2. Table of Contents: List each product included in manual, identified by product name, indexed to content of volume, and cross-referenced to Specification Section number in Project Manual.
 3. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - a. Include information needed for daily operations and management of systems and equipment. In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements. Include the following:
 - 1) Product name and model number.
 - 2) Manufacturer's name.
 - 3) Equipment identification with serial number of each component.
 - 4) Equipment function.
 - 5) Operating characteristics.
 - 6) Limiting conditions.
 - 7) Performance curves.
 - 8) Engineering data and tests.
 - 9) Complete nomenclature and number of replacement parts.
 - 10) Operating Procedures: Include startup, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.
 - 11) Systems and Equipment Controls: Describe sequence of operation, and diagram controls as installed.
 - 12) Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.
- D. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
1. If oversized drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 2. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.
- E. Include the following in combined or separate manuals
1. Manual for materials and finishes
 - a. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations
 - b. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance
 - c. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair
 2. Manual for equipment and systems

- a. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- b. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications
- c. Include color coded wiring diagrams as installed.
- d. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- e. Include control diagrams by controls manufacturer as installed.
- f. Include Contractor's coordination drawings, with color coded piping diagrams as installed.
- g. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- h. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections and deliver to Owner.

1.13 WARRANTIES

- A. Submittal Time: Submit written warranties on request of A/E or designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.14 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for specified period from date of Substantial Completion
- B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.
- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not used)

END OF SECTION 01700

SECTION 02220 - UTILITY OBSTRUCTIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. General provisions for handling utility obstructions and relocations.

1.2 RELATED REQUIREMENTS

- A. Section 01210: Allowances

1.3 UTILITIES SHOWN ON DRAWINGS

- A. The A/E had made reasonable effort to show the general location of existing underground and overhead utility lines on the Drawings.

1.4 RELOCATION OF OVERHEAD UTILITIES

- A. Determine in advance of construction operations if overhead utility lines, support structures, poles, guys, etc., whether shown on the Drawings or not, will obstruct construction operations. If any obstruction to construction operations is evident, coordinate with the appropriate utility company to remove or relocate the utility obstructions. Any charges by any utility company for removal or relocation of overhead utilities are the sole responsibility of the Contractor at no additional cost to the Owner.

1.5 RELOCATION OF UNDERGROUND UTILITIES

- A. Determine in advance of construction operations locations of all underground utilities (gas, telephone, electrical, cable TV, water, sewer), whether shown on the Drawings or not, that may interfere with Contractor's construction operations.
- B. All Underground Utilities *Except* Water and Sewer Lines: Coordinate with the appropriate utility company to remove or relocate the existing utilities which interfere with construction.
- C. Water and Sewer Lines:
1. Adjust alignment on any waterline which Contractor is constructing to avoid existing underground utility lines and/or to maintain a minimum three feet of cover; Take other measures necessary (encasement of water or sewer line, change of pipe material, etc.) to protect new and existing lines.
 2. Adjustment alignment of all existing waterlines as appropriate or required to avoid interference with:
 - a. new sewer lines, or;
 - b. new structures, or;
 - c. new roadway, or;
 - d. to maintain at least three feet of cover over existing waterlines unless otherwise approved in writing by A/E.
 3. Incidental work to be performed at no additional cost to Owner: All work required to adjust alignment of new waterlines around any existing waterlines or sewer lines.

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 02220

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Site clearing work includes, but is not limited to:
 - 1. Protection of Existing Improvements
 - 2. Protection of existing trees and vegetation
 - 3. Removal of trees and other vegetation
 - 4. Topsoil stripping
 - 5. Clearing and grubbing
 - 6. Disposal of waste materials

- B. Extent of Site Clearing is to the property line of the developed site shown on the Drawings.

1.2 JOB CONDITIONS

- A. Conduct site clearing operations to avoid interference with roads, streets, walks and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

1.3 PROTECTION OF EXISTING IMPROVEMENTS

- A. Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
- B. Protect improvements adjoining properties and on Owner's property.
- C. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

1.4 PROTECTION OF EXISTING TREES AND VEGETATION:

- A. Protect existing trees and other vegetation indicated to remain in place against unnecessary:
 - 1. Cutting
 - 2. Breaking or skinning of roots.
 - 3. Skinning and bruising of bark.
 - 4. Smothering by stockpiling construction materials or excavated materials within drip line.
 - 5. Excess foot or vehicular traffic.
 - 6. Parking of vehicles within drip line.

- B. Provide temporary guards to protect trees and vegetation to be left standing.

- C. Water trees and other vegetation to remain within limits of construction area as required to maintain plant health during the course of the construction operations.

- D. Provide protection for roots over 1-1/2" diameter cut during construction operations. Coat cut faces with emulsified asphalt or other acceptable coating formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 REMOVAL OF TREES AND OTHER VEGETATION:

- A. Remove trees, shrubs, grass and other vegetation, improvements or obstructions interfering with installation of new construction.
- B. Remove such items elsewhere on site or premises as specifically indicated.
- C. Removal includes digging out stumps and roots.
- D. Carefully and cleanly cut roots and branches of trees indicated to be left standing where such roots and branches obstruct new construction.

3.2 TOPSOIL STRIPPING:

- A. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter and without weeds, roots and other objectionable material.
- B. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
 - 1. Remove heavy growths of grass from areas before stripping.
- C. Stock Topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.

3.3 CLEARING AND GRUBBING:

- A. Clear site of trees, shrubs and other vegetation except for those indicated to be left standing.
 - 1. Completely remove stumps, roots, and other debris protruding through ground surface.
 - 2. Use only hand methods for grubbing inside drip line of trees indicated to be left standing.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

3.4 DISPOSAL OF WASTE MATERIALS

- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
- B. Removal from Owner's Property: Remove waste materials and unsuitable and excess topsoil from Owner's property and dispose of off site in legal manner.

END OF SECTION 02230

SECTION 02300 - EARTHWORK FOR STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Structure and Site Excavation, Filling and Backfilling
- B. Compaction of Fill and Backfill
- C. Finish Grading

1.2 RELATED SECTIONS

- A. Section 01300: Administrative requirements
- B. Section 01450: Quality Control
- C. Section 01500: Temporary facilities and Controls
- D. Section 02315: Trenching, Backfilling and Compacting

1.3 SUBMITTALS

- A. Laboratory Test Results for Select Fill, Ordinary Fill, and Pea Gravel:
 - 1. Moisture-density relationships (ASTM D1557)
 - 2. Gradation (ASTM C136, ASTM 422)
 - 3. Liquid limit, plastic limit, plasticity index (ASTM D4318)

1.4 PROTECTION

- A. Protect trees, shrubs, lawns, and other features remaining as a portion of final site.
- B. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.
- C. Protect above and below grade utilities which are to remain.
- D. Notify A/E of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- E. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- F. Grade excavation top perimeter to prevent surface water run-off into excavation.
- G. Protect structure walls, foundation, and similar features from structural stress during backfilling operations.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Material removed from excavations may be used for fill or backfill provided such material meets the requirements for fill and backfill specified in this Section. Some blending of materials may be necessary.
- B. Exclude debris, large rocks, roots, organic material, expansive material and other deleterious materials.
- C. Provide additional fill materials if necessary from off-site locations obtained by Contractor.
- D. Do not use any materials containing any contaminants that may endanger public health. Do not use mine tailings.
- E. Do not use any materials which have not been approved by the A/E.

2.2 MATERIALS

- A. Select Fill:
 - 1. Clean, well graded, relatively cohesionless material free of organic or frozen matter.
 - 2. Largest rock or clod dimension, 1"
 - 3. Plasticity index less than 8
 - 4. Maximum percent passing sieve (unless otherwise approved by A/E):
 - a. #10, 50%
 - b. #40, 30%
 - c. #200, 15%
- B. Ordinary Fill:
 - 1. Clean, free of organic or frozen matter.
 - 2. Largest rock or clod dimension, 3".
 - 3. Normally acceptable are Unified Soil Classification System Classified Materials: GW, GP, SW, SP, GM, SM, or GC.
- C. Normal Backfill:
 - 1. Excavated earth or sand thoroughly mixed to create uniform material.
 - 2. Free of trash, debris, organic or frozen matter.
 - 3. Largest rock or clod dimension, 2".
- D. Pea Gravel:
 - 1. Mineral aggregate graded 0.25" to 0.38".
 - 2. Free of soil, clay and shale; free of organic, frozen debris, or foreign matter.
- E. Sandfill:
 - 1. Clean, well-graded material conforming to requirements of ASTM C33 for fine aggregate.
- F. Moisture Barrier: 10 mil minimum polyethylene sheet.

PART 3 - EXECUTION

3.1 GENERAL

- A. The type of bearing material and the thickness and extent of structural fill (if required) are shown on the Drawings.
- B. Interior non-structural slabs-on-grade are to be supported on granular fill not less than 6 inches thick on structural fill not less than one foot thick. See Drawings for location where sand fill over polyethylene moisture barrier is required over granular fill.
- C. Do not place or compact fill or backfill when the atmospheric temperatures are below 35 degrees Fahrenheit. Protect completed fill or backfill areas from freezing. Recondition, reshape and recompact to the requirements of this section without additional cost to the Owner any areas which are damaged by freezing.

3.2 SHEETING, SHORING AND BRACING

- A. Provide sheeting, shoring and bracing where required to hold walls of excavation and to protect workers and existing construction. Contractor shall be responsible for proper sizing and placement of Work.
- B. Remove sheeting, shoring and bracing in manner to avoid damage to disturbance to Work. Leave sheeting and shoring in place where removal will endanger Work, adjacent construction or personnel. If sheeting or shoring is to be left in place, remove all traces of sheeting or shoring to a minimum depth of 2'-0" below finish grade unless otherwise approved by the A/E.

3.3 CLEARING AND GRUBBING

- A. General: Clearing and grubbing are required for all areas shown on the plans to be excavated or where fill is to be constructed.
- B. Clearing:
 - 1. Remove and dispose of trees and other vegetation, downed timber, snags, brush, and rubbish within areas to be cleared.
- C. Grubbing:
 - 1. Remove stumps, matted roots, and roots larger than 2 inches in diameter from within 6 inches of the surface of areas on which fills are to be constructed, and within 18 inches of finished subgrade of roadways.
 - 2. Areas disturbed by grubbing shall be filled as specified in this section for embankment.

3.4 PREPARATION

- A. Excavation:
 - 1. Identify required lines, levels, contours, and datum.
 - 2. Identify all underground utilities and other facilities. Stake and flag locations.
 - 3. Identify and flag surface and aerial utilities.
 - 4. Maintain and protect existing utilities remaining which pass through work area.
- B. Backfilling:
 - 1. When necessary, compact subgrade surfaces to density requirements for backfill material.
 - 2. Cut out soft areas of subgrade not readily capable of in situ compaction. Backfill with select fill and compact to density equal to requirements for subsequent backfill material.

3.5 EXCAVATION

- A. Earth excavation shall consist of the excavation and removal of suitable soils for use as embankment as well as the satisfactory disposal of all vegetation, debris, and deleterious materials encountered within the area to be graded and/or in a barrow area.
- B. Excavate soil to the extent required for structure foundations, construction operations, and other work. See Drawings for extent of excavation required beneath and adjacent to structures.
- C. Barricade open excavations, keep spoil piles out of the way of the Owner's personnel and otherwise maintain safe access by the Owner's employees to the Owner's facilities during construction.
- D. Do not undercut existing construction.
- E. Do not permit surface water to enter open excavations. Provide barriers and positive drainage away from excavations as necessary. Remove promptly any water which may enter excavations from any source.
- F. Machine slope banks.
- G. After excavations are complete, notify A/E for inspection of completed excavation. Do not begin placement of fill or begin other construction operations until excavation is approved by A/E.
- H. Fill unauthorized over excavated areas beneath structures with select fill and compact to density required for subsequent fill or backfill. If unauthorized excavation will result in structure being supported partly on select fill and partly on native material, extend excavation under entire structure and fill as specified below. Fill unauthorized overexcavated areas away from structures with fill of the type specified for subsequent fill compacted to the density specified.

3.6 SUBGRADE TREATMENT

- A. At areas to receive structural fill, scarify the exposed native soils to a depth of not less than 12 inches. Add or remove water as necessary to bring the scarified material to optimum moisture content (within -0, +2 percentage points). Compact the scarified soil to not less than 95 percent of maximum dry density as determined by ASTM D1557.

3.7 FILLING AND BACKFILLING

- A. Backfill areas to contours and elevations shown on Drawings using unfrozen materials.
- B. Place fill under structures and elsewhere as shown on the Drawings. Fill all unauthorized or excess excavations to the elevations shown or specified.
- C. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet or spongy subgrade surfaces.
- D. Backfilling Around Structures:
 - 1. Backfill after concrete has attained sufficient strength to withstand backfill pressures without detrimental effects.
 - 2. Prevent displacement of construction during backfilling operations; backfill opposite sides simultaneously.

- E. Placement:
 1. Maintain surfaces free of water, debris, and other deleterious materials.
 2. Place backfill and fill materials in successive horizontal layers not more than 8" in loose depth.
 3. Place material at optimum moisture content (plus or minus two percentage points).
 4. Material too dry or too wet shall be moistened or aerated to extent necessary to bring moisture content to within specified limits.

- F. Compaction:
 1. Compact fill and backfill using appropriate equipment as needed to achieve the densities specified below. Densities are expressed as percentages of the maximum dry density as determined by ASTM D1557.
 2. Do not use heavy equipment in areas where existing construction may be damaged by the use of such equipment. Repair or replace without additional cost to the Owner, any damage to existing construction caused by earthwork operations.

- G. Slope grade away from building minimum 2 inches in 10 feet unless noted otherwise. Fill depressions and provide for positive drainage away from buildings and structures.

- H. Make changes in grade gradual. Blend slopes into level areas. Finish grade to smooth uniformly sloping surfaces to elevations required for drainage.

- I. Finish surface by grading to provide finished appearance.

- J. Place polyethylene moisture barrier at locations shown on the Drawings. Overlap not less than 6 inches at all joints; tape joints securely. Protect from damage during placement of sand fill. Repair any rips or tears. Place not less than 3 inches of sand fill over polyethylene moisture barrier beneath slabs-on-grade where shown on Drawings.

3.8 TOLERANCES

- A. Top Surface of Backfill: Plus or minus 2 inches.
- B. Top Surface of Fill Beneath Structures: Minus 1 plus 0 inches.

3.9 FIELD QUALITY CONTROL

- A. Test Schedule:
 1. One field density test for each 250 square yards of prepared subgrade.
 2. One field density test for each 100 cubic yards of fill or for each layer of fill, whichever results in the greater number of tests.
 3. Or where directed by A/E.

- B. If tests indicate that work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.10 SCHEDULE OF FILL AND BACKFILL

Area	Type of Material	Degree of Compaction
Beneath footings and slabs more than 10 inches thick and for a distance outside their perimeters	Select fill	95%

equal to the depth of fill

Beneath slabs less
than 10 inches thick;
pavements (except roadways)
unless otherwise shown on
Drawings

Select fill 90%

General fills and
embankments on the site

Ordinary fill 90%

Non-structural areas
except as otherwise shown on
Drawings or directed by the
A/E

Ordinary fill 85%

Backfill behind walls
and below or adjacent to
additional construction

Select fill 95%

Backfill behind
retaining walls

Ordinary fill 90%

Backfill except as
described above

Normal backfill 90%

Where indicated on
Drawings

Select fill 95%

Fill within treatment
structures, fill beneath
interior slabs on grade
over moisture barrier

Sand fill 95%

END OF SECTION 02300

SECTION 02315 - TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Trenching, Backfilling, and Compacting for Buried Pipes
- B. Bedding of Buried Pipes

1.2 RELATED SECTIONS

- A. Section 01450: Quality Control
- B. Section 01500: Temporary Facilities and Controls

1.3 REFERENCES

- A. ASTM C12, Installing Vitrified Clay Pipe Lines
- B. ASTM D2774, Underground Installation of Thermoplastic Pressure Piping
- C. ASTM D2321, Underground Installation of Flexible Thermoplastic Sewer Pipe
- D. ANSI/AWWA C150/A21.50, Thickness Design of Ductile-Iron Pipe
- E. ANSI/AWWA C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- F. ANSI/AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances
- G. ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pie and Fitting for Water.
- H. OSHA Regulations, 29 CFR 1926 Subpart P – Excavations

1.4 SUBMITTALS

- A. Testing laboratory results on bedding materials to demonstrate compliance with specifications.
- B. Product data for identification tape and marker posts.

1.5 JOB CONDITIONS

- A. All trenching is unclassified.
- B. Protect adjacent structures and surrounding areas.
- C. Work to remain within available easements.
- D. Weather:

1. No backfill placement during freezing weather.
2. No frozen materials, ice or snow in backfill or fill.
3. No backfill or fill on frozen surfaces.

1.6 REGULATORY REQUIREMENTS

- A. Comply with OSHA Standard 29 CFR Part 1926, Subpart P - Excavations, during all excavation, trenching and shoring operations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bedding Materials:
 1. Bedding materials are those materials located a maximum of 8 inches below bottom of pipe to bottom or spring line of pipe, depending on bedding class or condition required.
 2. Material shall be granular and free flowing:
 - a. Maximum particle or clump size:
 - 1) Plastic Pipe 6" Diameter and Smaller: 0.5 inches
 - 2) All other Pipe: 0.75 inches
 - b. Portion Passing No. 200 Sieve: 50% maximum
 - c. Free from refuse, organic material and frozen soils.
 3. Materials require prior written approval.
 4. Concrete: Section 03300
- B. Initial Backfill Materials:
 1. Initial backfill material is that material placed above the bedding material, around and over the pipe to 12 inches over the top of the pipe.
 2. Material to be defined and required by applicable ASTM standard for installation for bedding class or type required or scheduled.
 3. In no case shall initial backfill material contain particles or clumps with any dimension greater than 0.75 inch.
 4. If not otherwise defined, same as bedding material.
- C. Backfill Materials:
 1. Backfill materials are those materials placed in the trench between the initial backfill material and the top of the trench.
 2. Material to be as defined and required by applicable ASTM standard for installation for bedding class or type required or scheduled.
 3. Backfill shall have no particles or clumps having a dimension larger than 6 inches within 3 feet of the top of the pipe.
- D. Materials Not Allowed:
 1. All pipe bedding, initial backfill, and backfill material shall be clean and free of roots, vegetable or organic material, frozen material, mine tailings, or any contaminants that could endanger public health.
 2. Identification Tape:
 - a. Identification tape shall consist of high visibility, color coded inert polyethylene tape that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil.
 - b. The tape shall have the following properties:
 - c. Minimum overall thickness: 4.0 mils
 - d. Minimum tensile strength: 1500 psi
 - e. Minimum weight: 10 lbs. per 1000 foot unit
 - f. Maximum imprint length: 36 inches

- g. Width: 6 inches
- 3. Tape to meet the APWA Recommended Color Code.
- 4. Acceptable Manufacturers:
 - a. Seton Name Plate Co., Branford, CT or A/E approved equivalent.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Field verify location of underground utilities and obstructions.

3.2 DEWATERING

- A. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the work.
- B. Keep excavation dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation or other cause will result.
- C. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12" below the bottom of the excavation.
- D. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property.
- E. Contractor is responsible for the condition of any pipe or conduit he uses for drainage; all drainage pipes, ditches, etc. shall be left clean and free of sediment.

3.3 BLASTING

- A. Blasting is not allowed.

3.4 SHEETING

- A. If used, cut off at top of pipe and leave in place unless removal is specifically approved by A/E.

3.5 STABILIZATION

- A. Thoroughly compact and consolidate trench bottoms so they remain firm, dense, and intact during required construction activities.
- B. Remove all mud and muck during excavation.
- C. Reinforce trench bottom with crushed rock or gravel if it becomes mucky during construction activities.
- D. Allow no more than 1/2 inch depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon.

- E. Where trench bottoms out in rock, rock is to be removed to 8 inches below bottom of pipe and replaced with bedding material.

3.6 TRENCH EXCAVATION

- A. Slope, bench or support all trenches in conformance with OSHA Excavation Regulations, and follow all specified safety requirements.
- B. Do not open more trench in advance of pipe laying than is necessary to expedite the work; not more than 400', unless otherwise authorized by A/E.
- C. Except where jacking and boring is indicated on the Drawings, specified or permitted by A/E, excavate trenches by open cut from the surface.
- D. Alignment, Grade and Minimum Cover:
 1. Establish alignment and grade or elevation from offset stakes.
 2. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the Drawings.
 3. Comply with pipe specification sections regarding vertical and horizontal alignment and max joint deflection.
 4. Water lines to have minimum bury as shown on the Drawings, and in general, grade shall follow surface contours unless otherwise shown on the Drawings.

- E. Limiting Trench Widths:
 1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, embedment.
 2. If needed to reduce earth loads to prevent sloughing cut banks back on slopes which extend not lower than 1' above the top of the pipe.
 3. Minimum trench widths and minimum clearances between installed pipe and trench wall:

Pipe Size	Minimum Trench Width	Minimum Clearance
18" or less	O.D. plus 16"	8"
larger than 18"	O.D. plus 24"	12"

- F. Mechanical Excavation:
 1. Do not use where its operation would damage trees, buildings, culverts or other existing property, structures or utilities above or below ground; hand excavate only in such areas.
 2. Use mechanical equipment of a type, design, and construction and operated so that:
 - a. Rough trench bottom elevation can be controlled.
 - b. Uniform trench widths and vertical sidewalls are obtained from 1' above the top of the installed pipe to the bottom of the trench.
 - c. Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls.
 - d. Do not undercut trench sidewalls.

- G. Cuts in Existing Paved Surfaces:
 1. Applies to streets, sidewalks, curbs, driveways, and other existing paved surfaces.
 2. No larger than necessary to provide adequate working space.
 3. Cut a clean groove not less than 1-1/2" deep along each side of trench or around perimeter of excavation area.
 4. Remove pavement and base pavement to provide shoulder not less than 6" wide between cut edge and top edge of trench.
 5. Do not undercut trenches, resulting in bottom trench width greater than top widths.
 6. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation.

7. Where the trench crosses existing paved surfaces, remove and replace the paved surface between saw cuts as specified for pavement.

H. Excavation Below Pipe:

1. Except as otherwise required, excavate trenches below the underside of pipes as indicated on the Drawings to allow placement of granular pipe bedding material.
2. Where excavating in earth for 6-inch and smaller pipe, Contractor has the following options for excavating trench bottoms:
 - a. Excavate below pipe subgrade and place granular embedment.
 - b. Grade trench bottom to provide uniform and continuous support between bell holes or end joints.

I. Excavation for Bell Holes:

1. Excavate to provide adequate clearance for tools and methods of pipe installation.
2. Do not allow any part of bells or couplings to contact the trench bottom, walls or granular embedment when pipe is joined.

3.7 PIPE BEDDING

- A. Class D per ASTM C12
- B. Class C per ASTM C12
- C. Class B per ASTM C12
- D. Crushed Stone Encasement per ASTM C12
- E. Class A-I: ASTM C12 Class A-1 using plain concrete.
- F. Class A-II: ASTM C12 Class A-1 using reinforced concrete; No. 4 A-36 steel reinforcing bars parallel to pipe with steel area not less than 0.4% of the area of concrete above top of pipe.
- G. Class A-III: ASTM C12 reinforced concrete encasement; 3000 psi concrete; No. 4 A-36 steel reinforcing bars; reinforcing parallel to pipe with steel area not less than 0.4% of the area of concrete above and below pipe; reinforcing bars wrapped around parallel bars at 36" maximum spacing.
- H. Bedding class or type as scheduled.
- I. Carefully place bedding in accordance with ASTM C12 to provide uniform and continuous support to pipe barrel except at bell holes in all cases. No bridging will be allowed.

3.8 TRENCH BACKFILL

- A. Material as defined by applicable reference for installation for type of pipe used.
- B. Initial Backfill: Place in layers that do not exceed 8 inches in height of backfill material in its uncompacted state.
- C. Backfill: Place in layers heights suitable to enable the Contractor to achieve the specified compaction throughout the full depth of backfill using his selected means and methods and without damaging the pipe.
- D. Bedding, Initial Backfill, and Backfill: If native materials cannot meet the requirements of Part 2 specified herein or if the specified field compaction cannot be obtained, Contractor shall import suitable material at no additional cost to the Owner

- E. Traveled Areas:
 1. 90 percent AASHTO T-180 compaction.
 2. Top 12" below subgrade, 95 percent AASHTO T-180 compaction.
- F. Untraveled Areas: Compacted to at least undisturbed natural density but not less than 85 percent AASHTO T-180.
- G. Water Settled Backfill: Use only where permitted by A/E:
 1. Where permitted, apply to obtain effective settlement with a minimum of water.
 2. Do not permit trench to overflow.
 3. Do not settle by water puddling until after trench has been backfilled to ground surface.
 4. Introduce water above the pipe embedment through a long pipe nozzle so disturbance of granular embedment or compacted material is held to an absolute minimum.
 5. Add backfill material to compensate for settlement below surface grade and settled during puddling operations.
- H. Install identification tape in backfill 18 inches directly above top of pipe for all non-metallic pipes, unless otherwise scheduled or shown on Drawings.
- I. Install Utility Marker Posts as Follows:
 1. Install posts in untraveled areas over centerline of pipe at each horizontal bend made with fittings and at 500 feet intervals between bends.
 2. Install face of posts perpendicular to centerline of pipe and facing the downstream direction.
 3. Bury posts 18" deep.
- J. Upper 18 inches of trench shall contain no particles larger than 6 inches in any dimension.
- K. Surface Finish:
 1. For placement of paving or gravel surfacing, subgrade where applicable.
 2. Match existing and surrounding contours.
 3. Graded finished appearance.

3.9 FIELD QUALITY CONTROL

- A. Test Schedule unless otherwise directed by the A/E:
 1. Minimum of one field density test for each compacted layer of trench backfill for each 250 linear feet of trench in traveled areas.
 2. Minimum of one field density test for each compacted layer of trench backfill for each 500 linear feet of trench in untraveled areas.
 3. Minimum of two field density tests for each compacted layer of trench backfill at each road crossing.

3.10 PIPE BEDDING SCHEDULES

- A. Cast or Ductile Iron Pipe:
 1. Minimum Bedding Class:

<u>Pipe Diameter</u>	<u>Trench Depth To Top of Pipe</u>	<u>Bedding Class</u>
14" or less	5' or less	D
	5'-12'	C
	more than 12'	B
larger than 14"	12' or less	C
	more than 12'	B

- B. PVC, HDPE, and Other Plastic Type Pipes:
 - 1. As recommended by manufacturer.
 - 2. Minimum bedding class:
 - a. Trench depth to top of pipe less than 10'; Class C
 - b. Trench depth to top of pipe 10' or more; Class B
 - 3. Gravity sewer lines bedded to meet maximum deflection requirements given with pipe specifications.
- C. Concrete:
 - 1. Minimum bedding class: Class B
- D. Corrugated Metal Pipe:
 - 1. Minimum bedding class:
 - a. Trench depth to top of pipe less than 5'; Class C
 - b. Trench depth to top of pipe more than 5'; Class B
- E. Unstable Trench Conditions Due to Groundwater:
 - 1. Crushed Stone Encasement

3.11 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Protecting installed construction
 - a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - 1) Clearly describe the change by note and by graphic line, as required.

END OF SECTION 02315

SECTION 02700 - SUBGRADE PREPARATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Preparing the completed subgrade prior to placement of subsequent pavement section components to the grade and dimensions indicated on the Drawings. This is inclusive of all processing, shaping, compacting, watering, protecting and any removal and replacement of unsuitable material to prepare the subgrade satisfactorily for completion of the pavement section.

1.2 RELATED WORK

- A. Section 01450: Quality Control
- B. Section 02315: Trenching, Backfilling, and Compacting
- C. Section 02720: Crushed Aggregate Base Course
- D. Section 02740: Asphaltic Concrete Surface Course
- E. Section 02770: Concrete Curb and Gutter, Sidewalk, and Drivepads

1.3 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM D1556, Density of Soil in Place by the Sand-Cone Method
 - 2. ASTM D1557, Test for Moisture-Density Relations of Soils Using 10-lb. Hammer and 18-in. Drop
 - 3. ASTM D2167, Density of Soil in Place by the Rubber-Balloon Method
 - 4. ASTM D2216, Laboratory Determination of Moisture Content of Soil
 - 5. ASTM D2922, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - 6. ASTM D3017, Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.4 QUALITY ASSURANCE

- A. Testing Laboratory:
 - 1. Contractor shall provide material testing for quality control during subgrade preparation.

PART 2 - PRODUCTS

2.1 SUITABLE MATERIALS

- A. Suitable materials shall consist of materials obtained on site approved by the Engineer for the purpose of subgrade preparation.
- B. Any underlying soft or otherwise unsuitable material shall be removed and replaced with suitable material.

- C. Provide free of vegetation.

2.2 WASTE

- A. Disposal of excavated materials shall be the responsibility of the Contractor. Excess material to be placed in location designated by Owner or Engineer.

PART 3 EXECUTION

3.1 PREPARATION

- A. Excavations and embankments for the roads and site grading shall be finished to the shapes, dimensions, and elevations shown on the Drawings.
- B. Perform clearing operations prior to beginning excavation, grading, and embankment operations.
- C. Processed, watered, and compacted to not less than 90% of modified Proctor density (AASHTO T-180) at optimum moisture content $\pm 2\%$, to a depth of 12" minimum.
- D. Material that cannot be processed satisfactorily to meet these specifications shall be considered unsuitable.

3.2 GRADING

- A. Provide uniform slopes and rounded changes in slope, free of low spots.
- B. The degree of grade control shall not deviate from true grade and profile more than one-half inch as measured by a ten-foot straight edge.
- C. Drainage:
 - 1. Provide and maintain positive surface water drainage around and away from open excavations.
 - 2. Keep opened excavations dry.
 - 3. Remove free water in excavation promptly.

3.3 FIELD QUALITY CONTROL

- A. Sample and Test:
 - 1. At intervals not to exceed 200 feet.
 - 2. At locations designated by the Engineer.

END OF SECTION 02700

SECTION 02770 - CONCRETE CURB AND GUTTER, SIDEWALK, AND DRIVEPADS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This work shall consist of the construction of portland cement concrete curb and gutter, sidewalk, and drivepads as indicated on Drawings.

1.2 RELATED WORK

- A. Section 01450: Quality Control
- B. Section 02700: Subgrade Preparation
- C. Section 03300: Concrete

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M33, Preformed Expansion Joint Filler for Concrete (Bituminous Type).
 - 2. AASHTO M153, Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - 3. AASHTO M173, Concrete Joint-Sealer, Hot-Poured Elastic Type.
 - 4. AASHTO M55, Welded Wire Fabric for Concrete Reinforcement.

1.4 QUALITY ASSURANCE

- A. Allowable Tolerances:
 - 1. Finished surfaces will not be acceptable if varying from a straight line by more than 1/8 inch when checked with a 10-foot straightedge.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT CONCRETE

- A. See Section 03300.

2.2 JOINT FILLERS

- A. Preformed expansion joint filler - AASHTO M33 or M153.

2.3 JOINT SEALERS

- A. AASHTO M173

2.4 REINFORCING

- A. AASHTO M55
- B. 6 x 6 – 10 x 10 welded wire fabric with supporting chairs shall be installed in all drive pads.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to placing forms, check to see that the subgrade has been compacted to the degree required by Section 02700.

3.2 CONCRETE

- A. Formwork to be constructed in accordance with Section 03300.
- B. Construct concrete in accordance with Section 03300.
- C. Concrete shall be poured to thicknesses and dimensions shown on Drawings.

3.3 FINISHING

- A. Curb and Gutter:
 - 1. Give concrete a light broom finish with the brush marks parallel to the curb line or gutter line.
- B. Sidewalk and Drivepads:
 - 1. Give concrete a light broom finish with the bush marks perpendicular to the curb line or gutter line.

3.4 JOINTS

- A. Provide Control Joints at 6' on Center Maximum:
 - 1. Extend joint into the concrete for at least one-third of the depth and make it approximately 1/8" wide.
- B. Provide 1/2" preformed expansion joints at 36' on center maximum, at curb returns and adjacent to buildings, walls and other immovable objects.
- C. Edge all edges not specifically dimensioned with a 1/4" or a 3/8" edging tool.
- D. Seal all joints.

3.5 BACKFILLING

- A. Remove all forms.
- B. Do not place earth backfill or pavement adjacent to curb and gutter or sidewalk until at least 7 curing days have elapsed.

- C. Backfill with approved material.
- D. Thoroughly compact backfill to the same density as the subgrade and at the proper moisture content.

3.6 SCHEDULE

- A. Concrete for curb and gutter, sidewalk, and drivepads on this project shall meet the following requirements:
 - 1. Compressive strength at 28 days:
 - 2. Design slump: 4 inches maximum

END OF SECTION 02770

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.2 RELATED SECTIONS

- A. Section 01450 Quality Control.
- B. Section 03366 Chemical Concrete Floor Stain.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.
- B. Architectural Finish Concrete: Slick surface finish free of honeycombing in areas exposed to view and to be used as the finished wall surface.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mix water to be withheld for later addition at Project site.
 - 2. Submit substantiating data for each concrete mix design to the Architect no less than six weeks prior to first concrete placement.
 - 3. Data to include:
 - a. Mix identification.
 - b. Mix proportions.
 - c. Wet and dry unit weight.
 - d. Entrained air content.
 - e. Design slump.
 - f. Field test data.
 - g. Required average strength data per ACI 318.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures. Provide wall elevations at 1/4-inch scale indicating bar size, spacing, and arrangement.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.

- E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Cementitious materials and aggregates.
 2. Form materials and form-release agents.
 3. Steel reinforcement and reinforcement accessories.
 4. Admixtures.
 5. Waterstops.
 6. Curing materials.
 7. Floor and slab treatments.
 8. Bonding agents.
 9. Adhesives.
 10. Vapor retarders.
 11. Vapor barriers.
 12. Epoxy joint filler.
 13. Joint-filler strips.
 14. Repair materials.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An installer with a minimum of 5 years of completed concrete Work experience similar in material, design, and extent to that indicated for this Project and whose Work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm with a minimum of 5 years of experience in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-- Reinforcing Steel."
- F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 301, "Specification for Structural Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practical sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, Class A.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Rectangular Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified form-work surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Available Products: Subject to compliance with requirements; provide the following:
 - a. US SPEC Ezkote, or US SPEC Slickote, or US SPEC Safekote; US MIX Products Co. 303-778-7227 (Or Approved Similar)
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or water-proofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, Grade 60 (Grade 420) deformed.
- C. Plain Steel Welded Wire Fabric: ASTM A185.
- D. Deformed Steel Welded Wire Fabric: ASTM A497, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.
- C. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I or II.
- B. Fly Ash: ASTM C 618, Class C or F.
- C. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Nominal Maximum Aggregate Size: 1-inch.
- D. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.6 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: Flat, dumbbell with center bulb.
- B. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat, dumbbell with center bulb.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Rubber Waterstops:
 - a. Greenstreak.
 - b. Progress Unlimited Inc.
 - c. Westec Barrier Technologies; Division. of Western Textile Products, Inc.
 - d. Williams Products, Inc.
 2. PVC Waterstops:
 - a. Greenstreak.
 - b. Meadows: W. R. Meadows, Inc.
 - c. Murphy: Paul Murphy Plastics Co.
 - d. Progress Unlimited Inc.
 - e. Sternson Group.
 - f. Tamms Industries Co.; Division. of LaPorte Construction Chemicals North America, Inc.
 - g. Vinylex Corporation.
 - h. Westec Barrier Technologies; Division. of Western Textile Products, Inc.
- D. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
 - b. Conseal CS-231; Concrete Sealants Inc.
 - c. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
 - d. Hydrotite; Greenstreak.
 - e. Mirastop; Mirafi Moisture Protection, Division. of Royal Ten Cate (USA), Inc.
 - f. Adeka Ultra Seal; Mitsubishi International Corporation.
 - g. Superstop; Progress Unlimited Inc.

2.7 VAPOR RETARDERS

- A. Vapor Retarder: ASTM E 1745, Class C, of one of the following materials; or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick:
1. Nonwoven, polyester-reinforced, polyethylene coated sheet; 10 mils (0.25 mm) thick.
 2. Three-ply, nylon- or polyester-cord-reinforced, laminated, high-density polyethylene sheet; 10 mils (0.25 mm) thick.
- B. Vapor Retarder membrane must have a minimum permeance per ASTM E-96 of 0.03 perms and minimum WVTR per ASTM E-96 of 0.0008.
- C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 (4.75-mm) sieve and 10 to 30 percent passing a No. 100 (0.15-mm) sieve; meeting deleterious substance limits of ASTM C 33 for fine aggregates.

- D. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.8 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. **For areas not intended to receive concrete stain:** Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- E. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Evaporation Retarder: US SPEC Monofilm ER; US MIX Products Co., (303) 722-8426 (Or Approved Similar)
 - 2. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: US SPEC Radiance UV; US MIX Products Co., (303) 722-8426 (Or Approved Similar)

2.10 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
 - 2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm).
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5700 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Exterior Slab on Grade: Proportion normal weight concrete mix as follows:
 - 1. Compressive Strength (28 Days): 4500 psi
 - 2. Maximum slump: 4 inches.
 - 3. Maximum water/cement ratio: 0.40
- D. Other Areas: Coordinate concrete strength with "Structural General Notes" on Drawings.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Combined Fly Ash and Pozzolan: 20 percent.
- F. Maximum Water-Cementitious Materials Ratio: 0.40 for concrete exposed to deicers or subject to freezing and thawing while moist.

- G. Maximum Water-Cementitious Materials Ratio: 0.50 for concrete subject to moderate sulfate exposure.
- H. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete subject to severe or very severe sulfate exposure.
- I. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as indicated on Structural Drawings.
- J. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- K. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability after review by Structural Engineer of Record.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions after a review by Structural Engineer of Record.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class B, 1/4 inch (6 mm).
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 - 1. Do not use rust-stained steel form-facing material.

- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Do not chamfer corners or edges of concrete that are not exposed.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. All surfaces coming in contact with form release agent should be free of dirt, oil, grease, laitance, paints and other contaminants. Spray surfaces of forms with form-release agent, before placing reinforcement. Fully saturate form. All runs and puddles should be removed with a squeegee or soft rag.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.
 - 2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.
 - 4. Cast-in-metal nosings at stairs are prohibited.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. 28-day design compressive strength.
 - 2. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.
 - 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
- B. Install Vapor Retarder:
 - 1. Unroll Vapor Retarder with the longest dimension parallel with the direction of the pour.
 - 2. Lap Vapor Retarder over footings and seal to foundation walls.
 - 3. Overlap joints 6 inches and seal with manufacturer's tape.
 - 4. Seal all penetrations (including pipes) with manufacturer's pipe boot.
 - 5. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities.
 - 6. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all four sides with tape.
- C. Granular Fill: Cover vapor retarder with granular fill according to Geotechnical Report's recommendation, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as reviewed by Structural Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
1. Sawn Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- E. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

3.9 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 2. Do not apply rubbed finish to smooth-formed finish.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.
- C. Rough-Formed Finish: As-cast concrete texture imported by form facing materials with the holes and defective areas repaired and patched. Removed fins and other projections exceeding ADI 347 limits.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Float Finish: (Interior) Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing.
- C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. **For slabs to receive concrete stain:** cover concrete with vapor retarder and protect from foot traffic until fully cured and prepared to receive concrete stain.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Architect's and Structural Engineer's review, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 5. Unit Weight: ASTM C for normal-weight concrete one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
 - 7. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days, two at 28 days, and one specimen will be retained for later testing if required.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- E. Test results shall be reported in writing to Architect, Structural Engineer, concrete manufacturer, and Contractor within 1 working day of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect/Structural Engineer. Testing and inspecting agency may conduct tests to determine

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adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

- G. Notify Structural Engineer at least 24 hours prior to all concrete pours.

END OF SECTION 03300

SECTION 03366 - CHEMICAL CONCRETE FLOOR STAIN

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to Work of this Section.
- B. Section Includes:
 - 1. Chemically stained concrete floor finish.
 - 2. Sealer.
- C. Related Sections:
 - 1. Division 3 Section "Cast-In-Place Concrete" for general applications of concrete.
 - 2. Division 7 Section "Joint Sealants" for placement of sealants.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's technical data sheets and installation instructions for each product specified.
- B. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.
- C. Qualification Data: For firms indicated in "Quality Assurance" Article, including lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of stain and sealer products shall have minimum 5 years experience in the production of the specified products.
- B. Installer Qualifications: Minimum 3 years experience in staining applications and successfully completed not less than 5 projects comparable in scale and complexity.
- C. Regulatory Requirements:
 - 1. Products shall comply with the United States Clean Air Act for maximum Volatile Organic Compound (VOC) content as specified in PART 2 of this section.
- D. Source Limitations: Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.
- E. Field Samples:
 - 1. Provide under provisions of Division 1 Section "Quality Control."
 - 2. If instructed by Architect, prepare on-site mockup 4 by 4 feet (1.2 by 1.2 m) for review and approval.

3. Construct field samples using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in field sample and mockup panels.
4. Samples and mockups shall be stained and sealed by the individual workers who will actually be performing the work for the Project.
5. Obtain written approval from Architect before start of work.
6. Retain approved field samples through completion of the Work for use as a quality standard for finished work.
7. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.
- B. Store specified products in conditions recommended by the manufacturer.

1.5 PROJECT CONDITIONS

- A. Environmental Conditions: Maintain an ambient temperature of between 50° and 90° F during application and at least 48 hours after application.
- B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

1.6 PRE-JOB CONFERENCE

- A. One week prior to the placement of Chemical Stain a meeting will be held to discuss the project and application of materials.
- B. It is suggested that the Architect, General Contractor, Construction Manager, Subcontractor and a Manufacturer Representative be present.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: L.M. SCOFIELD COMPANY, Douglasville, Georgia and Los Angeles, California (800) 800-9900 or the appropriate local contact: Western Division – 714-568-1870.

2.2 MATERIALS

- A. Chemical Stains: LITHOCHROME® Chemstain™; L.M. SCOFIELD COMPANY, reactive water-based solution of metallic salts which react with the calcium hydroxide in the cured concrete substrate to produce permanent, variegated or translucent color effects.

1. Colors: Architect to select from the following manufacturer's standard colors:
 - a. Color 1: CS-12 Weathered Bronze.
 - b. Color 2: CS-11 Fern Green.
 - c. Color 3: CS-13 Copper Patina.
 - d. Color 4: CS-15 Antique Amber.
 - e. Color 5: CS-16 Faded Terracotta.
 - f. Color 6: CS-14 Dark Walnut.
 - g. Color 7: CS-2 Padre Brown.
 - h. Color 8: CS-1 Black.

- B. Sealers:
 1. CEMENTONE® Clear Sealer; L.M. SCOFIELD COMPANY, a one-part, water-based acrylic sealer made specifically to seal old or new, exterior or interior concrete flatwork.
 2. SCOFIELD® Selectseal-W™; L.M. SCOFIELD COMPANY, water-based, clear aliphatic polyurethane specifically formulated for protecting chemically stained concrete hardscapes and floors.
 3. SCOFIELD® Cureseal-W™ Semi-gloss; L.M. SCOFIELD COMPANY, a clear curing and sealing compound for protecting concrete hardscapes and floors.

- C. Sealants: LITHOSEAL™ Trafficalk-3G™; L.M. SCOFIELD COMPANY.
 - a. Colors: to match adjacent stained concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Contractor shall examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

- B. Compliance with Manufacturer's Instructions: Contractor shall obtain, understand and comply with the current versions of the manufacturer's technical data sheets and installation instructions as referenced in Section 1.2.A. Wherever technical data such as preparation or installation instructions differs from language in this specification or other written material, the information submitted in accordance with Section 1.2.A is considered definitive.

3.2 PREPARATION

- A. New Concrete:
 1. Newly placed concrete shall be sufficiently cured to allow concrete to become reactive, minimum 14 days.
 2. If any of the following colors are used, the minimum cure time of the concrete shall be 30 to 60 days to meet water vapor transmission requirements.
 - a. Copper Patina.
 - b. Fern Green.
 - c. Weathered Bronze.
 3. Do not use liquid curing materials. Cure concrete flatwork with new, unwrinkled, non-staining, high quality curing paper. Do not overlap curing paper.
 4. Surfaces shall be cured using the same method and different sections (pours) chemically stained when the concrete is the same age.

5. Immediately prior to chemically staining, thoroughly clean the concrete. Sweep surfaces, then pressure wash or scrub using a rotary floor machine. Use suitable, high quality commercial detergents to facilitate cleaning. Rinse surfaces after cleaning until rinse water is completely clean. Allow floor to dry completely prior to application of floor stain.
- B. Scoring: Score decorative jointing in concrete surfaces 1/8-inch (3.2 mm) deep with diamond blades. Rinse until water is completely clean. Score before staining. See Drawings.

3.3 APPLICATION OF CHEMICAL STAIN

- A. Concrete surfaces shall be dry and properly prepared as described above. Protect surrounding areas from over-spray, run-off and tracking. Divide surfaces into small work sections using wall, joint lines, or other stationary breaks as natural stopping points.
- B. Apply chemical stains full strength (undiluted) at the coverage rate recommended by the manufacturer and use application equipment described in the manufacturer's printed technical literature. The color of the liquid chemical stain has no resemblance to the final color produced on the concrete substrate.
- C. Chemical stains normally fizz when reacting with the concrete. If fizzing does not occur, the substrate has not been adequately prepared or the concrete pH level is too low. If this should happen, contact the local representative for further recommendations.
- D. Transfer chemical stain to the substrate by brush or spray and immediate scrub into surface.
- E. Reaction time depends on wind conditions, temperatures, and humidity levels.
- F. When multiple coats of one or more colors are required, washing and drying between colors is desirable to evaluate the color prior to the next coat.
- G. After the final coat of chemical stain has remained on the surface for a minimum of four hours, remove all residue by wet scrubbing with commercial grade detergent. Rinse surfaces after scrubbing until rinse water is completely clean. Run off may stain the adjacent areas or harm plants. Collect rinse water by wet vacuuming or absorbing with an inert material.

3.4 APPLICATION OF SEALER

- A. Concrete substrate shall be completely dry.
- B. Sealer shall be produced by the chemical stain manufacturer.
- C. Test surface for proper PH level prior to applying sealer.
- D. Apply sealer according to manufacturer's written instructions at a rate of 300 to 500 square feet per gallon per coat.
- E. Maintain a wet edge at all times.
- F. Allow sealer to completely dry before applying additional coats.
- G. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.
- H. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.5 PROTECTION

- A. Protect floor from traffic for at least 72 hours after final application of sealer.

3.6 MAINTENANCE

- A. Maintain chemically stained and sealed floors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet-clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Maintain interior floors that require polishing by using a compatible, premium-grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.
 - 1. Information on commercial floor polishes is available by contacting Johnson Diversey, Sturtevant, Wisconsin, 800-558-2332.

3.7 APPLICATORS

- A. For a list of qualified contractors, contact your local Scofield representative or the appropriate Division Office: Western Division – 714-568-1870.

END OF SECTION 03366

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Concrete unit masonry.
 - 2. Reinforced unit masonry.

1.02 RELATED SECTIONS

- A. Section 04820 Architectural Unit Masonry for ground-face units.
- B. See Division 5 Section "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
- C. See Division 7 Section "Sheet Metal Flashing and Trim" for furnishing manufactured reglets installed in masonry joints for metal flashing.

1.03 SUBMITTALS

- A. Product data for each different masonry unit, accessory, and other manufactured product specified.
- B. Samples for selection of colored-masonry mortar samples showing the full range of colors available.
- C. Samples for verification of the following:
 - 1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
- D. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
 - 1. Mortar complying with BIA M1.
 - 2. Grout mixes. Include description of type and proportions of grout ingredients.
 - 3. Masonry units.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Based on evaluation of agency-submitted criteria conforming to ASTM C 1093.
- B. Preconstruction Testing:
 - 1. Concrete Masonry Unit Test: For each different concrete masonry unit indicated, test units for strength, absorption, and moisture content per ASTM C 140.
 - 2. Prism Test: For each type of wall construction indicated, test masonry prisms per ASTM E 447, Method B.

3. Test mortar properties per test methods of ASTM C 270.
4. Evaluate mortar composition and properties per ASTM C 780.
5. Test grout compressive strength per ASTM C 1019.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.06 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:
 1. Conform to "Recommended Practices and Guide Specifications for Cold Weather Masonry Construction" of IMI.
 2. Remove and replace work which has been frozen or damaged by freezing conditions.
- D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.
 - 1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:
 - a. See structural general notes.
 - 2. Weight Classification: Normal.
 - 3. Provide Type I, moisture-controlled units.
 - 4. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:
 - a. 4 inch nominal: 3 5/8 inch actual.
 - b. 8 inch nominal: 7-5/8 inch actual.
 - c. 10 inch nominal: 9-5/8 inch actual.
 - d. 12 inch nominal: 11-5/8 inch actual.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
 - 1. For pigmented mortars, use colored portland cement-lime mix of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.
- D. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.
- E. Aggregate for Grout: ASTM C 404.
- F. Water: Potable, clean and free of salts or alkalis causing effervescence.

2.03 JOINT REINFORCEMENT

- A. General: Provide joint reinforcement formed from the following:
 - 1. ASTM A 641, Class 1, for interior walls; and ASTM A 153, Class B-2, for exterior walls.
 - 2. ASTM A 153, Class B-2, for exterior walls and ASTM A 641 Class 1 for interior walls.

- B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:
 - 1. Wire Diameter for Side Rods: Duro-O-Wall Seismic or approved similar.
 - 2. Wire Diameter for Cross Rods: Duro-O-Wall Seismic or approved similar.
- C. For single-wythe masonry, provide type as follows with single pair of side rods:
 - 1. Ladder design with perpendicular cross rods spaced not more than 16 inches o.c.
 - 2. Truss design with continuous diagonal cross rods spaced not more than 16 inches o.c.

2.04 TIES AND ANCHORS

- A. Materials:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
 - 1. Wire: Fabricate from 1/4-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.

2.05 RIGID ANCHORS

- A. General: Fabricate from steel bars as follows:
 - 1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.

2.07 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C.

2.08 EMBEDDED FLASHING MATERIALS

- A. Rubberized Asphalt Sheet Flashing: Manufacturer's standard composite flashing product consisting of a pliable and highly adhesive rubberized asphalt compound, 32 mils thick, bonded completely and integrally to a high-density, cross-laminated polyethylene film, 8 mils thick, to produce an overall thickness of 40 mils.
 - 1. Primer: Flashing manufacturer's standard product or product recommended by flashing manufacturer for bonding flashing sheets to masonry and concrete.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness.
- B. Preformed Control-Joint Gaskets: Styrene-Butadiene Rubber Compound: ASTM D 2000, Designation M2AA-805.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep Holes: Rectangular Plastic Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches.
- E. Cavity Drainage Material: 1-inch-thick, reticulated, nonabsorbent mesh, made from polyethylene strands and shaped to maintain drainage at weep holes without being clogged by mortar droppings.
 - 1. Product: Mortar Net™

2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:
 - 1. Limit cementitious materials in mortar to portland cement and lime.
 - 2. For masonry below grade, in contact with earth, and where indicated, use type indicated below:
 - a. Type: S.
 - 3. For reinforced masonry and where indicated, use type indicated below:
 - a. Type: S.
 - 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions, and for other applications where another type is not indicated, use type indicated below:
 - a. Type: N.
- C. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.
 - 1. Use fine grout in grout spaces less than 2 inches in horizontal dimension, unless otherwise indicated.
 - 2. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.

3.02 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
 - 1. Running bond and as indicated on the Drawings.
- D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- E. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:
 - 1. Install compressible filler in joint between top of partition and underside of structure above.

3.03 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
 - 4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.04 CAVITIES

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
 - 1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.
- B. Tie exterior wythe to back-up with individual metal ties. Stagger alternate courses.

3.05 HORIZONTAL-JOINT REINFORCEMENT

- A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12 inches beyond opening.
 - 4. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.08 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
 - 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.
 - 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 - 3. Build-in joint fillers where indicated.
 - 4. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Maintain joint free and clear of mortar.
- B. Build-in horizontal pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."
 - 1. Locate horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.09 LINTELS

- A. Install loose steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb for opening less than 6 feet and 8 inches for wider openings, unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

- C. Install flashing as follows:
1. At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches, and through the inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches, unless otherwise indicated.
 2. At masonry-veneer walls, extend flashing from exterior face of veneer, through the veneer, up face of sheathing at least 8 inches, and behind air-infiltration barrier/building paper.
 3. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.
 4. Cut off flashing flush with face of wall after masonry wall construction is completed.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
1. Form weep holes with product specified in Part 2 of this Section.
 2. Space weep holes 24 inches o.c.
 3. Place cavity drainage material immediately above flashing in cavities.
- E. Install vents in vertical head joints at the top of each continuous cavity. Space vents and close off cavities vertically and horizontally with blocking in manner indicated.
1. Install through-wall flashing and weep holes above horizontal blocking.
- F. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.11 INSTALLATION OF REINFORCED UNIT MASONRY

- A. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Do not exceed the following pour heights for fine grout:
 2. Provide cleanout holes at least 3 inches in least dimension for grout pours over 60 inches in height.
 3. Provide cleanout holes at each vertical reinforcing bar.
 4. At solid grouted masonry, provide cleanout holes at not more than 32 inches o.c.

3.12 FIELD QUALITY CONTROL

- A. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
- B. Mortar properties will be tested per ASTM C 780.
- C. Grout will be sampled and tested for compressive strength per ASTM C 1019.
- D. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.
- E. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:
1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

END OF SECTION 04810

SECTION 04820 - ARCHITECTURAL CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Products furnished but not installed under this Section.: Architectural units comply with the same quality standards as conventional concrete masonry, Standard Specification for Loadbearing Concrete Masonry Units, ASTM C 90.
- B. Extent of masonry work is indicated on Drawings and Schedule. Types of Architectural Concrete Unit Masonry Required Include:
 - 1. Ground-Face (Polished) Unit Masonry.
- C. Related Sections:
 - 1. Install products furnished under this Section in Accordance with Section 04810 Concrete Unit Masonry.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C-90, Load Bearing Masonry Units.
 - 2. ASTM C-90, Modified for Architectural Units.
- B. Joint Effort of the American Concrete Institute, the American Society of Civil Engineers, and the Masonry Society:
 - 1. ACI 530.1-95/ASCE 6-95/TMS 602-95 - Specification for Masonry Construction.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory and other manufactured products.
- B. Compliance: Submit certifications that each type complies with ASTM C90 for concrete masonry units.
- C. Color Selection: For initial selection submit:
 - 1. Samples showing full extent of colors and textures available for each type of exposed masonry unit required.
 - 2. Colored mortar samples showing full extent of colors available.
- D. Samples: For verification purposes submit:
 - 1. Full-size unit masonry samples for each type of exposed masonry unit. Include full range of color and texture to be expected in completed work.
 - 2. Colored masonry mortar samples for each color required showing the full range of color which can be expected in the finished work. Label samples to indicate type and amount of colorant used.

1.4 QUALITY ASSURANCE

- A. Five percent of a shipment may contain chips not larger than 1 in. in any dimension, or cracks not wider than 0.02 in. and not longer than 25% of the nominal height of the unit.

- B. An approved sample consisting of not less than four units representing the range of color and texture permitted shall be used to determine color and texture conformance
- C. Field Constructed Mock-Ups: Prior to installation of masonry work, erect sample wall panels to represent completed masonry work for qualities of appearance, materials, construction and workmanship.
 - 1. Build mock-ups for each type of exposed unit in sizes approximately 4' long by 3'-4" high, by full thickness.
 - 2. Mock-ups shall include the full range of color and texture to be expected in the finished work.
 - 3. Mock-ups shall be approved by the Architect/Owner prior to commencement of the work.
 - 4. Mock-ups shall remain onsite until completion of masonry installation.
- D. Completed work having units with color and texture falling outside of the range of the approved samples shall be subject to rejection.
- E. Completed work showing workmanship of lesser quality than the mock-up shall be subject to rejection
- F. For units which will be used in exposed wall construction, the presence of objectionable imperfections is based on viewing the face or faces from a distance of not less than 20 ft under diffused lighting.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver Masonry Materials to Project in Undamaged Condition:
 - 1. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.
 - 2. All masonry units shall be delivered to the jobsite on wood pallets and packaged with protective cushions between all layers to eliminate chipping. Each pallet to be protected with a plastic cover.
- B. Store materials protected from exposure to harmful weather conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basalite Concrete Products, 1300 E. Franklin Rd, Meridian, ID 83642
- B. Best Block Company, 8227 Blakeland Drive, Littleton, Colorado 80125
- C. Rinker Materials, 6026 2nd Street NW, Albuquerque, NM 87107

2.2 MATERIALS

- A. General:
 - 1. All units will conform to ASTM C-90.
 - 2. Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
 - 3. Provide special shapes where required for lintels, jambs, corners, sash, control joints, headers, bonding and other special conditions.
 - 4. All units shall be sound and free of cracks or other defects that would interfere with the proper placing of the units or impair the strength or performance of the construction.
 - 5. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated on Drawings.
 - 6. Weight Classification: Normal (Medium) Weight.
 - 7. Hollow Load-Bearing Block: ASTM C-90, normal weight (125 lbs. per cubic foot dry weight).

8. Solid Load-Bearing Block: ASTM C-90, normal weight (125 lbs. per cubic foot dry weight).
9. Minimum Net Area Average Compressive Strength: 2500 PSI
10. Water Absorption 10 lbs/cu ft maximum; provide integral water-repellant.
11. Units shall be integrally colored; colors shall be selected by the Architect from manufacturers standard color range for each type of unit.

B. Exposed Face Finish:

1. Ground-Face (Polished, Burnished, Honed) CMU:
 - a. Ground-face corner units shall be used at all exposed corners.
 - b. Face design shall be ground-face

2.3 RELATED MATERIALS

- A. Mortar and Grout: Refer to Division 4, Reinforced Unit Masonry Section.
- B. Reinforcement: Refer to Division 4, Reinforced Unit Masonry Section.

2.4 SOURCE QUALITY CONTROL

- A. Single Source Responsibility for Masonry Units: Obtain architectural masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- B. Manufacturer shall not have less than ten (10) years experience for this type of unit.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins and product catalog installation instructions.

3.2 EXAMINATION

- A. Site verification of conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

3.3 PREPARATION

- A. Adjacent Surface Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.4 INSTALLATION

- A. General: Refer to Division 4 Reinforced Unit Masonry Section for installation requirements.
- B. Pattern: Install Architectural Concrete Masonry Units in pattern indicated on Drawings. Maintain pattern lines. Match approved job mockup.

- C. Elevation Tolerances: Elevations of installed Architectural Concrete Masonry units do not exceed 1/4" in 10' or 3/8" in a story height of 20' maximum, except for external corners, expansion joints and other conspicuous lines, do not exceed 1/4" in any one story or 20' maximum.
- D. Expansion and Control Joints: Refer to Division 4 Reinforced Unit Masonry section for expansion and control joints.

3.5 CLEANING AND PROTECTION

- A. Cleaning:
 - 1. Good workmanship and job housekeeping practices shall be used to minimize the need for cleaning the masonry.
 - a. Masonry wall should be dry brushed at end of each days work and also after final pointing and should be left clean and free from mortar droppings.
 - b. Protect the base of the wall from mud splashes and mortar droppings, protect the wall by setting scaffolds so that mortar is not deflected onto the wall and at the end of each day set the scaffolding boards so that they do not deflect rainfall onto newly laid masonry.
 - c. The masonry laying technique shall be such that mortar does not run down the face of the wall, or smear the masonry face, after the joints are tooled, cut off mortar tailings with the trowel and brush excess mortar burrs and dust from the face of the masonry.
 - 2. If after using the above outlined techniques, additional cleaning of masonry is necessary, the technique, solutions and test area shall be approved by the owner, A/E and manufacturer in writing.
 - a. The masonry shall be thoroughly saturated prior to and at the time the cleaning solution is applied.
 - b. Clean the masonry only with an approved cleaning solution with a brush starting at the top of the masonry.
 - c. The solutions and the method of scraping shall be as outlined on the container by the manufacturer.
 - d. Immediately after cleaning a small area, the masonry shall be rinsed thoroughly with quantities of water sufficient to rinse cleaning solution completely.
 - e. High pressure water and sandblasting shall not be used for cleaning except with the recommendation of the manufacturer and the written approval of the A/E.
 - 3. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Remove construction debris from protected site and legally dispose of debris.
- B. Protection: Protect installed products finish surfaces from damage during construction.

END OF SECTION 04820

SECTION 04860 – SYNTHETIC STONE ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes exterior synthetic stone veneer.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Stone Samples for Verification: For each color, grade, finish, and variety of stone required.
- C. Colored Mortar Samples for Verification: For each color required.
- D. Qualification Data: For Installer.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.
- B. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single manufacturer with resources to provide materials of consistent quality in appearance and physical properties.
- C. Source Limitations for Mortar Materials: Obtain ingredients of a uniform quality for each mortar component from a single manufacturer and each aggregate from one source or producer.
- D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Build mockups for each type of stone veneer assembly in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness, including face and backup.
 - a. Include stone coping at top of mockup.
 - b. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit stone veneer above half of flashing).
 - 2. Protect accepted mockups from the elements with weather-resistant membrane.
 - 3. Approval of mockups is for color, texture, and blending of stone; relationship of mortar and sealant colors to stone colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Contractor in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Contractor in writing.

4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 PROJECT CONDITIONS

- A. Protection of Stone Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone veneer assemblies when construction is not in progress.
 1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone masonry.
 1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 SYNTHETIC STONE

- A. Basis of Design: GAF Canyon Rock, Inc.
- B. Manufacturers:
 1. Coronado Masonry, Inc.
 2. Cultured Masonry, Inc.
 3. Eldorado Stone, Inc.
- C. Product: Premium Natural Ledge Stone
 1. Color: per Architect
 2. Blend: per Architect
 3. Joint Style: per Architect.
 4. Stack Pattern: per Architect.

- D. Match Architect's samples for variety, color range, finish, and other stone characteristics relating to aesthetic effects.
- E. Design selections: See Drawings.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207.
- D. For pigmented mortar, use a colored cement formulation as required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations.
- E. Aggregate: ASTM C 144 and as follows:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
 - 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- F. Mortar Pigments: Natural or synthetic iron oxides, compounded for use in mortar mixes and with a record of satisfactory performance in stone masonry mortars.
- G. Latex additive (water emulsion) described below, serving as replacement for part of or all gaging water, of type specifically recommended by latex-additive manufacturer for use with job-mixed portland cement mortar and not containing a retarder.
 - 1. Latex Additive: Styrene-butadiene rubber or acrylic resin.
- H. Water: Potable.

2.3 VENEER ANCHORS

- A. Materials:
 - 1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316.
 - 2. Stainless-Steel Sheet: ASTM A 666, Type 304.
- B. Wire Veneer Anchors: Formed from W1.7 or 0.148-inch- (3.8-mm-) diameter, stainless-steel wire.
- C. Adjustable, Screw-Attached Veneer Anchors: Units consisting of a wire tie section and a metal anchor section that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

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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. Dur-O-Wal, a Dayton Superior Company
 - b. Heckmann Building Products Inc.
 - c. Hohmann & Barnard, Inc.
 - d. Wire-Bond.
 2. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
 3. Anchor Section: Sheet metal plate, 1-1/4 inches (32 mm) wide by 6 inches (150 mm) long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch (16 mm) wide by 5 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie.
 4. Fabricate sheet metal anchor sections and other sheet metal parts from 0.097-inch- (2.5-mm-) thick, steel sheet, galvanized after fabrication.
 5. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.25-inch- (6.4-mm-) diameter, hot-dip galvanized-steel wire.
- D. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 (4.8-mm diameter) by length required to penetrate steel stud flange with not less than three exposed threads.
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. Dur-O-Wal, a Dayton Superior Company; Stainless Steel SX Fastener.
 - b. ITW Buildex; Scots Long Life Tek.

2.4 EMBEDDED FLASHING MATERIALS

- A. Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.
- B. Weep Holes:
1. Rectangular Plastic Tubing: Clear butyrate, 3/8 by 1-1/2 inches (10 by 38 mm) by thickness of stone veneer assembly.
 2. Plastic Weep Hole/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, designed to fill head joint with outside face held back 1/8 inch (3 mm) from exterior face of stone veneer, in color selected from manufacturer's standard.
- C. Cavity Drainage Material: Free-draining mesh made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

2.6 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry-measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry-measure laundry detergent dissolved in 1 gal. (4 L) of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by stone producer.

2.7 STONE FABRICATION

- A. General: Fabricate stone in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.
- B. Cut and select stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.
 - 1. Clean sawed backs of stone to remove rust stains and iron particles.
- C. Thickness of Stone Veneer: Provide thickness indicated, but not less than the following:
 - 1. Thickness: 3-1/2 and 1-1/2 inches, plus or minus 1/2 inch.
- D. Dress joints (bed and vertical) straight and at right angle to face, unless otherwise indicated.
- E. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.
- F. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.

2.8 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
- B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Mortar for Setting Stone: Type S.
- C. Mortar for Scratch Coat over Metal Lath: 1 part Portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Accurately mark stud centerlines on face of weather-resistant sheathing paper before beginning stone installation.

- B. Coat concrete and unit masonry backup with asphalt dampproofing.

3.2 SETTING OF STONE MASONRY, GENERAL

- A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use power saws to cut stone that is fabricated with saw-cut surfaces.
 - 2. Use hammer and chisel to split stone that is fabricated with split surfaces.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in three-course, random-range ashlar pattern with random course heights, random lengths (interrupted coursed), and uniform joint widths.
- D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- E. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inch (6 mm) at narrowest points or more than 1/2 inch (13 mm) at widest points.
- F. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealing joints is specified in Division 7 Section "Joint Sealants."
- G. Sheet metal flashing: Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 - 1. At stud-framed walls, extend flashing through stone masonry, up the face of sheathing at least 12 inches (300 mm), and behind weather-resistant sheathing paper.
 - 2. At concrete backing, extend flashing through stone masonry, turned up a minimum of 6 inches (150 mm), and insert in reglet. Reglets are specified Division 7 Section "Sheet Metal Flashing and Trim."]
 - 3. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches (150 mm) into masonry at each end.
 - 4. At sills, extend flashing not less than 4 inches (100 mm) at ends.
 - 5. At ends of head and sill flashing turn up not less than 2 inches (50 mm) to form end dams.
 - 6. Extend sheet metal flashing 1/2 inch (13 mm) beyond face of masonry at exterior and turn flashing down to form a drip.
- H. Flexible flashing: Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 - 1. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 - 2. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
 - 3. Cut flexible flashing flush with face of wall after masonry wall construction is completed.
- I. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.

1. Use round plastic tubing to form weep holes.
2. Use wicking material to form weep holes above flashing in stone sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches (600 mm) o.c.

3.3 INSTALLATION OF ANCHORED STONE MASONRY

- A. Anchor stone masonry to concrete with corrugated-metal veneer anchors unless otherwise indicated. Secure anchors by inserting dovetailed ends into dovetail slots in concrete.
- B. Anchor stone masonry to stud framing with adjustable, screw-attached veneer anchors unless otherwise indicated. Fasten anchors through sheathing to framing with two screws.
- C. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches (38 mm), through stone masonry and with at least 5/8-inch (16-mm) cover on outside face.
- D. Space anchors not more than 16 inches (400 mm) o.c. vertically and 24 inches (600 mm) o.c. horizontally. Install additional anchors within 12 inches (300 mm) of openings, sealant joints, and perimeter at intervals not exceeding 12 inches (300 mm).
- E. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.
- F. Fill space between back of stone masonry and concrete walls below grade with mortar as stone is set.
- G. Provide 1-inch (25-mm) cavity between stone masonry and backup construction unless otherwise indicated. Keep cavity free of mortar droppings and debris.
 1. Place mortar spots in cavity at veneer anchors to maintain spacing.
 2. Slope beds toward cavity to minimize mortar protrusions into cavity.
 3. Rake mortar for a drystack appearance. Keep joint 3/4" from face of all adjacent stones, minimum.

3.4 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.
 6. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.
 7. Clean limestone masonry to comply with recommendations in ILLI's "Indiana Limestone Handbook."

3.5 EXCESS MATERIALS AND WASTE

- A. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

END OF SECTION 04860

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Structural steel.
2. Architecturally exposed structural steel.
3. Grout.

B. Related Sections include the following:

1. Division 1 Section "Quality Control" for independent testing agency procedures and administrative requirements.
2. Division 5 Section "Steel Deck" for field installation of shear connectors.
3. Division 5 Section "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
4. Division 9 Section "Painting " for surface preparation and priming requirements.

1.2 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.
- B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

C. Welding certificates.

D. Qualification Data: For Installer fabricator testing agency.

E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.

3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

F. Source quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CASE.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Cbd.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- E. Comply with applicable provisions of the following specifications and documents:
1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
 3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 5. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Mockups: Build mockups of architecturally exposed structural steel to set quality standards for fabrication and installation.
1. Coordinate finish painting requirements with Division 9 painting Sections.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Corrosion-Resisting Structural Steel: ASTM A 588/A 588M, Grade 50 (345).
- E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- F. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847, structural tubing.
- G. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
- H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8,) compressible-washer type.
 - a. Finish: Plain.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers, plain.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490 (ASTM F 959M,) Type 10.9, compressible-washer type, plain.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex head steel structural bolts with splined ends; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

- E. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - 4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- F. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
 - 2. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - 3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- G. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
- H. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- I. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

- A. See Section 09900 for structural steel to be exposed in pool area.
- B. Primer: SSPC-Paint 25, Type I, iron oxide, zinc oxide, raw linseed oil, and alkyd.
- C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

- A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
- C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

- B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
 - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
 - 2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- D. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- H. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
- I. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.
- J. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces.
 - 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- 1. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials.
 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 1. Interior Areas: SSPC-SP 3, "Power Tool Cleaning."
 2. Exterior and Interior Pool Areas: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
 1. Fill vent holes and grind smooth after galvanizing.
 2. Galvanize lintels, shelf angles attached to structural-steel frame and located in exterior walls.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings-- Allowable Stress Design and Plastic Design.
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of base plate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- 1. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design". for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

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- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

- C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

END OF SECTION 05120

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Open-web K-series steel joists.
 - 2. KCS-type, open-web K-series steel joists.
 - 3. LH-series long-span steel joists.
 - 4. DLH-series deep long-span steel joists.
 - 5. Joist girders.
 - 6. Joist accessories.

1.2 RELATED SECTIONS

- A. Section 01450 Quality Control.

1.3 DEFINITIONS

- A. Special Joists: Joists requiring modification by the manufacturer to support nonuniform, unequal, or special loading conditions that invalidate SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads within limits and under conditions indicated.
 - 1. Structural Performance: Provide special joists and connections capable of withstanding the design loads as indicated in the Drawings
- B. Design joists to withstand design loads with total load deflections no greater than the following:
 - 1. Roof Joists: Vertical deflection of 1/240 of the span.

1.5 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated.
- B. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.
 - 1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.
 - 2. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation.

- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Research/Evaluation Reports: Evidence of steel joists' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
 - 2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 3. Professional Engineer Qualifications: A professional engineer who is legally authorized 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 joists that are similar to those indicated for this Project in material, design, and extent.
- B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for chord and web members.
- B. Steel Bearing Plates: ASTM A 36/A 36M.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- D. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain, uncoated.

- E. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

- A. Primer for general areas: SSPC-Paint 15, Type I, red oxide; FS TT-P-636, red oxide; or manufacturer's standard shop primer complying with performance requirements of either of these red-oxide primers.
- B. Primer for pool area: see Section 09960 High Performance Coatings.

2.3 OPEN-WEB K-SERIES STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord; of joist type indicated.
 - 1. Joist Type: K-series steel joists.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Do not camber joists.
- G. Camber joists according to SJI's "Specifications."
- H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.
- B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications."
- C. Bridging: Fabricate as indicated and according to SJI's "Specifications."
 - 1. Furnish additional erection bridging if required.
- D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.
- D. Painting of joists and joist accessories is specified in Division 9 Section "Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.
- E. Bolt joists to supporting steel framework using high-strength structural bolts, unless otherwise indicated. Comply with RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds
- B. Field welds will be visually inspected according to AWS D1.1.
- C. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following procedures, as applicable:
 - 1. Radiographic Testing: ASTM E 94 and ASTM E 142.
 - 2. Magnetic Particle Inspection: ASTM E 709.
 - 3. Ultrasonic Testing: ASTM E 164.
 - 4. Liquid Penetrant Inspection: ASTM E 165.
- D. Bolted connections will be visually inspected.
 - 1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.
- F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates and abutting structural steel.
 - 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 - 2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 Section "Painting."
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05210

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Roof deck.

1.2 RELATED SECTIONS

- A. Section 01450 Quality Control.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
- C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. 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. Mechanical fasteners.
2. Acoustical roof deck.
- F. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed steel deck 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. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations for Cellular Deck Floor Systems with Electrical Distribution: Obtain cellular floor deck units and compatible electrical components, such as preset inserts, activation kits, afterset inserts, service fittings, header ducts, and trench header ducts, from the same manufacturer. Electrical components are specified in Division 16 Section "Underfloor Raceway."

- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- E. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- F. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
- G. Electrical-Raceway Units: Provide UL-labeled cellular floor deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.
- H. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Deck:
 - a. BHP Steel Building Products USA Inc.
 - b. Consolidated Systems, Inc.
 - c. Epic Metals Corp.
 - d. Marlyn Steel Products, Inc.
 - e. Nucor Corp.; Vulcraft Div.
 - f. Roof Deck, Inc.
 - g. United Steel Deck, Inc.
 - h. Verco Manufacturing Co.
 - i. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
 - 1. See structural drawings and specifications.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8 mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 29 for overhang and slab depth.
- H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- I. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- J. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch (1.90 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.
- K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and recessed pans of 1-1/2- inch (38-mm) minimum depth. For drains, cut holes in the field.
- L. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
- M. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.
- N. Galvanizing Repair Paint: ASTM A 780.
- O. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate decking bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels for entire length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches (38 mm) long, and as indicated on Drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated on Drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) minimum or butted at Contractor's option.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least 1 weld at each corner.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

- A. Testing: Engage a qualified independent testing agency to perform field quality-control testing.
- B. Field welds will be subject to inspection.
- C. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:
 - 1. Shear connector stud welds will be visually inspected.
 - 2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
 - 3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Remove and replace work that does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Exterior load-bearing wall framing.
 - 2. Exterior non-load-bearing wall framing.
 - 3. Furring Channels (Furring Members)
 - 4. Hat-Shaped, Rigid Furring Channels
- B. Related Sections:
 - 1. Division 1 Section 1045 Quality Control.
 - 2. Division 7 Section 07411 Metal Roof Panels and 07412 Metal Wall Panels.

1.2 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.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated on the Structural Drawings.
 - 2. Deflection Limits: As indicated on the Structural Drawings.
 - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as As indicated on the Structural Drawings.
- B. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- C. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. 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. Vertical deflection clips.
 - 2. Horizontal drift deflection clips

1.5 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 licensed in the State of New Mexico 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, ductility, and galvanized-coating thickness.
- E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- F. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- 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 E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
- 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. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
 1. Clark Steel Framing Industries.
 2. Dietrich Industries, Inc.
 3. Knorr Steel Framing Systems.
 4. Unimast, Inc.
 5. United Metal Products, Inc.

2.2 MATERIALS

- A. Galvanized-Steel Sheet: ASTM A 446 (ASTM A 446M), zinc coated according to ASTM A 525 (ASTM A 525M), and as follows:
 1. Coating Designation: G 90 (Z 275).
 2. Grade: As required by structural performance.

2.3 EXTERIOR LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:
 1. Minimum Uncoated-Steel Thickness: 0.0538 inch.
 2. Flange Width: 1-5/8 inches.
 3. Maximum spacing: 16 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, complying with ASTM C 955, and as follows:
 1. Minimum Uncoated-Steel Thickness: Matching steel studs.
 2. Flange Width: 1-1/4 inches.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:
 1. Minimum Uncoated-Steel Thickness: 0.0538 inch.
 2. Flange Width: 1-5/8 inches.
 3. Maximum spacing: 16 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:
 1. Minimum Uncoated-Steel Thickness: 0.0538 inch.
 2. Flange Width: 1-1/4 inches.
- 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: 0.0428 inch.
 2. Flange Width: 2 inches.
- 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: 0.0428 inch.
 - b. Flange Width: 2 inches
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Uncoated-Steel Thickness: 0.0428 inch.
 - b. Flange Width: 3-1/2 inches.
- E. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
- G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch and depth required to fit insulation thickness indicated in Division 7 Section "Building Insulation."

2.5 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.
- 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.
 6. Gusset plates.
 7. Stud kickers, knee braces, and girts.
 8. Joist hangers and end closures.
 9. Hole reinforcing plates.
 10. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to 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 and as acceptable to Structural Engineer. 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 and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch 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.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to ASTM C 1007, 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.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened in accordance with the structural drawings, 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 and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As shown on Shop Drawings.
- B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: 16 inches indicated.
- 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.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 NON-LOAD-BEARING INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches as indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single 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 studs and anchor to primary building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.
- G. Direct Furring:: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 - 1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.6 FIELD QUALITY CONTROL

- A. Testing: Engage a qualified independent testing agency to perform field quality-control testing and in accordance with Division 1 Section "Structural Tests and Inspections."
- 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.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.
- C. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.
- D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.
- E. 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 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Steel ladders.
 - 2. Loose bearing and leveling plates.
 - 3. Loose steel lintels.
 - 4. Steel framing and supports for countertops.
 - 5. Steel framing and supports for mechanical and electrical equipment.
 - 6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 7. Pipe bollards.

1.02 SUBMITTALS

- A. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.
- B. Welding Certificates: Copies of certificates for welding procedures and personnel.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.03 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.04 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.05 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.02 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- E. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- F. Slotted Channel Framing: Cold-formed metal channels with flange edges returned toward web and with 9/16-inch- (14.3-mm-) wide slotted holes in webs at 2 inches (51 mm) o.c.
 1. Width of Channels: 1-5/8 inches (41 mm).
 2. Depth of Channels: 1-5/8 inches (41 mm).
 3. Metal and Thickness: Galvanized steel complying with ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.
 4. Metal and Thickness: Galvanized steel complying with ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating; 0.079-inch (2-mm) nominal thickness.
 5. Finish: Hot-dip galvanized after fabrication.
- G. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).
- H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

- I. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

- I. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.03 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in equal to "Carboline-Shop Primer No. 2," selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Primer shall be applied at a minimum film thickness of 2.0 dry-mils.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with "Carboline-Galvanox (Or Approved Equal).
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.04 FASTENERS

- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.
- D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
- H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).
- I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 1. Material:
 - a. Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - b. Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.05 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.06 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Shear and punch metals cleanly and accurately. Remove burrs.
- C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- J. Remove sharp or rough areas on exposed traffic surfaces.
- K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.07 STEEL LADDERS

- A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
 - 1. Comply with ANSI A14.3, unless otherwise indicated.
 - 2. For elevator pit ladders, comply with ASME A17.1.
- B. Siderails: Continuous, 1/2-by-2-1/2-inch (12-by-64-mm) steel flat bars, with eased edges, spaced 18 inches (457 mm) apart.
- C. Bar Rungs: 3/4-inch- (19-mm-) diameter steel bars, spaced 12 inches (300 mm) o.c.
- D. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.
- F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
- G. Galvanize ladders, including brackets and fasteners

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
 - 3. Furnish inserts if units must be installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Fabricate supports for operable partitions as follows:
 - 1. Beams: Continuous steel shapes of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.12 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.

- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim.

2.13 PIPE BOLLARDS

- A. Fabricate pipe bollards from Schedule 40 steel pipe.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch (6-mm) thick steel plate welded to bottom of sleeve.

2.14 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.15 STEEL AND IRON FINISHES

- C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123, for galvanizing steel and iron products.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- E. Shop primer shall be compatible with the paint systems specified in Division 9 Section "Painting."
- F. Steel and iron fabrications exposed to view shall be finished with high performance paint system as specified in Division 9 Section "Painting."

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.02 SETTING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified above for setting and grouting bearing and leveling plates.
 - 1. Do not grout baseplates of columns supporting steel girders until girders are installed and leveled.
- E. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified above for setting and grouting bearing and leveling plates.
 - 1. Do not grout baseplates of columns supporting steel girders until girders are installed and leveled.

3.04 INSTALLING PIPE BOLLARDS

- A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.
- B. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) greater than OD of bollard. After bollards have been inserted into holes, fill annular space surrounding bollard solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.
- C. Fill bollards solidly with concrete, mounding top surface.

END OF SECTION 05500

SECTION 05720 - HORIZONTAL STEEL CABLE RAILING SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Horizontal steel cable railing system.
- B. Related Sections: 05521 – Pipe Railings, for handrails at exterior stairs

1.2 REFERENCES

- A. ASTM A 36 - Carbon Structural Steel.
- B. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- C. ASTM A 108 - Steel Bars, Carbon, Cold Finished, Standard Quality..
- D. ASTM A 320 - Alloy Steel Bolting Materials for Low-Temperature Service.
- E. ASTM A 500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- F. MIL-C-5688 - Pre-Stretching and Proof-Testing of Wire Rope Assemblies.
- G. MIL-W-87161 - Wire Strand, Non-Flexible, for Aircraft Control. Oil Free Condition.
- H. SAE/AMS QQ-S-763 -Steel Bars, Wire, Shapes, and Forgings; Corrosion-Resistant.

1.3 DESIGN REQUIREMENTS

- A. Cable railing system, including guard rail, hand rail, bottom rail, end posts, intermediate posts, intermediate cable braces, cables, and cable hardware shall be designed to conform to building codes and loading requirements.
- B. Cable railing system shall withstand a minimum single concentrated load of 200 pounds applied in any direction at any point along the top, and have attachment devices and supporting structure to transfer the load to appropriate structural elements.
- C. Intermediate posts and cables shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot, including openings and space between rails. Reactions due to this loading need not be added to loading specified for main supporting members of cable railing system.
- D. Railing frame components and cable hardware shall be designed to withstand loads encountered without excessive deflection or distortion when cables are tensioned to required amounts to conform to building codes.

1.4 SUBMITTALS

- A. Comply with Section 01330 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including installation instructions.

- C. Shop Drawings: Submit fabricator's shop drawings, showing sizes, dimensions, details, and installation of railing frame components, intermediate cable braces, cables, cable hardware, and grommets. Show details of anchoring cable railing system to mounting surface.
- D. Material Samples: Submit samples of the following:
 - 1. Railing frame components by fabricator.
 - 2. Intermediate cable braces by fabricator.
 - 3. Cables by manufacturer or fabricator.
 - 4. Cable hardware by manufacturer or fabricator.
 - 5. Grommets by manufacturer or fabricator
- E. Fabricator's Quality Assurance: Submit fabricator's certification that materials comply with specified requirements and are suitable for intended application.
- F. Warranty: Submit manufacturer's standard warranty for cables and cable hardware. Submit fabricator's warranty for railing frame components and intermediate cable braces.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Cable railing system components shall be product of a single source.
- B. Preinstallation Meeting: Convene a preinstallation meeting 2 weeks before start of construction of railing frame component mounting surfaces. Require attendance of parties directly affecting work of this section, including Contractor, Architect, Fabricator, and Installer. Review the following:
 - 1. Specific method of installation of railing frame components into mounting surfaces.
 - 2. Installation, adjusting, cleaning, and protection of cable railing system.
 - 3. Coordination with other work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site, with labels or other markings clearly identifying material name and contractor or fabricator.
- B. Storage: Store materials in a clean, dry area. .
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Ultra-tec Cable Railing Systems, 5224 Highway 50 East, Carson City, Nevada 89701-1484. Toll Free (800) 851-2961. Phone (775) 885-1443. Fax (775) 885-2734. Web Site www.ultra-tecrailings.com. e-mail www.info@ultra-tecrailings.com

2.2 HORIZONTAL STEEL CABLE RAILING SYSTEM.

- A. Railing Frame Components
 - 1. Style: Structural Tubing
 - 2. Member Size: 2 inch by 2 inch square structural tubing
 - 3. Material: Carbon steel, ASTM A 500, Grade A, minimum tensile strength 45,000 psi.

- B. Top Rails, Bottom Rails, Intermediate Posts : Min 0.120 inch wall thickness structural tubing
 - 1. Intermediate Post spacing as shown on drawings
- C. End Posts and Single Post Corners: Material: Minimum 0.250 inch (6 mm) wall thickness 2 inch x 2 inch structural tubing.
- D. Corner Posts: When Radiused Tubes Are Used: Minimum 0.120 inch wall structural tubing.
- E. Intermediate Cable Braces:
 - 1. Type: 1-piece.
 - 2. Size: 1/4 inch x 1 inch.
 - 3. Spacing: As recommended by the system manufacturer
 - 4. Material: C.F. steel
- F. Rail Height: 42" min
- G. Welded Receiver: ASTM A 108, Type 1018 carbon steel. Weld into outside wall of an end post. Hide weld by grinding welded surface to original contour.
- H. Welded Tabs: ASTM A 108, Type 1018 carbon steel. Weld into outside wall of an end post. Hide weld by grinding welded surface to original contour.
- I. Threaded Tab: Screws into drilled and tapped hole in the inside wall of an end post.
- J. Post Mounting: Foot mounting
- K. Finish:
 - 1. Powder coated. Apply final finish before installation of cable hardware, and cables.
- L. Grommets:
 - 1. Material: UV-resistant HDPE.
 - 2. Cable Grommets: Provides barrier to abrasion of intermediate posts and cable braces bored for cables.
 - 3. Color: Black

2.3 CABLES AND CABLE HARDWARE

- A. Cables:
 - 1. Material: 1 x19 Type 316 stainless steel strand.
 - 2. Compliance: MIL-W-87161, Type II, Composition B, Construction 2 left-hand lay.
 - 3. Minimum Breaking Strength, MIL-C-5688 6,900 pounds.
 - 4. Diameter: 1/4 inch.
 - 5. Orientation: Horizontal
 - 6. Spacing: As required to maintain less than 4" between cables.
 - 7. Finish.: Mill
- B. Cable Hardware
 - 1. General: Stainless Steel: ASTM A 276 and A 479, SAE/AMS QQ-S-763, Type 316 stainless steel.
 - 2. Swaging: Swage hardware onto ends of cables in manufacturer's shop
- C. Cable Hardware: Provide hardware necessary for a complete system
 - 1. Material: ASTM A 276 and A 479, SAE/AMS QQ-S-763, Type 316 stainless steel.
 - 2. Swaging: Swage hardware onto ends of cables in manufacturer's shop
 - 3. Swaging Ferrule: Retains nonadjustable and adjustable fitting onto cables.
 - 4. Swaged Ferrule With Flat Washers: Retains washers on cables placed into counterbore. Use with counterbored hole in end post.

5. Adjustable Tensioner: Screw lag threaded end into end post. Expose fine screw thread for mating with body section of adjustable fitting and lock nut.
6. Lag Eye Fitting: Screw lag threaded end into end post. Expose paddle-shaped eye to accommodate nonadjustable or adjustable fitting.
7. Swaging Stud: Use with receiver or welded receiver. Provides a means of tensioning cables in as small an area as is feasible.
8. Receiver shall allow tensioning hardware to be hidden within end post. Use with 3/16 inch thick x 1 inch wide flat bar attached to outside of end post with stainless steel flat head screws. Use with washer to place into counterbore. Use with counterbored hole in end post.
9. Nonadjustable Clevis Fitting: Fixed Jaw. Held onto cables by swaging ferrule.
10. Adjustable Clevis Fitting: Tensioner shall provide a considerable amount of take-up in cables. Held onto cables by swaging ferrule.
11. Adjustable Fitting with Threaded Eye Tensioner: shall provide a considerable amount of take-up in cables. Held onto cables by swaging ferrule.
12. Radius Ferrule: Nonadjustable. Attaches cable to post with hardware hidden inside post.
13. Clip-on Stop: Nonadjustable. Attaches cable to post with washer and clip, hidden inside end post.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Field verify dimensions prior to fabrication
- B. Examine areas to receive cable railing system. Notify A/E if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install cable railing system in accordance with manufacturer's instructions at locations indicated on the drawings.
- B. Install cable railing system plumb, level, square, and rigid.
- C. Anchor cable railing system to mounting surface as indicated on the drawings.
- D. Do not field weld components.
- E. Install specified cable hardware onto ends of cables using manufacturer's supplied swaging equipment in accordance with manufacturer's instructions.
- F. Use manufacturer's supplied cable hardware.
- G. Terminate and tension cables in accordance with manufacturer's instructions.
- H. Tension cables to a minimum of 400 pounds each in sequence in accordance with manufacturer's instructions.
- I. Ensure cables are clean, parallel to each other, and without kinks or sags.
- J. Replace defective or damaged components as directed by A/E.
- K. Repair damaged factory-applied finish as directed by A/E.

3.3 ADJUSTING

- A. Adjust cables and cable hardware as required to provide properly installed cable railing system as directed by A/E.

3.4 CLEANING

- A. Clean surfaces.
- B. Do not use abrasive cleaners.

3.5 PROTECTION

- A. Protect cable railing system and finish from damage during construction.

END OF SECTION 05720

SECTION 06105 - MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes wood furring, grounds, nailers, plywood and blocking.

1.02 SUBMITTALS

- A. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
 3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.01 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWWA C2 (lumber) and AWWA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
1. Do not use chemicals containing chromium or arsenic.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

- C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m).

2.02 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWWA C20 (lumber) and AWWA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Treatment Types: Interior Type A for protected wood and Exterior for wood exposed to weather.
- B. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.03 MISCELLANEOUS LUMBER

- A. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- B. Moisture Content: 19 percent maximum for lumber items are not specified to receive wood preservative treatment.
- C. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.04 PLYWOOD

- A. Plywood: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2, "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.
- B. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.
- C. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."
- D. Miscellaneous Concealed Panels: APA-rated sheathing, Exposure 1, span rating to suit framing in each location.
- E. Plywood Underlayment: Underlayment B-C Exterior with fully sanded face, thickness as indicated but not less than 1/2 inch (12.7 mm).
- F. Miscellaneous Exposed Plywood: A-D Interior, thickness as indicated but not less than 1/2 inch (12.7 mm).
- G. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch (11.9 mm) thick.

2.05 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where miscellaneous carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- F. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
- G. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.02 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install where shown and where required for screeding or attaching other work. Cut and shape to required size. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.03 INSTALLATION OF PLYWOOD PANELS

- A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 - 1. Comply with "Code Plus" provisions of above-referenced guide.

END OF SECTION 06105

SECTION 06130 - HEAVY TIMBER CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials for exterior wood railings using timbers.

1.2 RELATED SECTIONS

- A. Section 05500 for timber connection devices. See structural drawings.

1.3 DEFINITIONS

- A. Timbers: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.
- B. Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. NLGA - National Lumber Grades Authority.
 - 3. SPIB - Southern Pine Inspection Bureau.
 - 4. WCLIB - West Coast Lumber Inspection Bureau.
 - 5. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

- A. Certificates of Inspection: Issued by lumber grading agency for exposed timber not marked with grade stamp.

1.5 QUALITY ASSURANCE

- A. Timber Standard: Comply with AITC 108, "Standard for Heavy Timber Construction."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of heavy timber construction to avoid extended on-site storage and to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 HEAVY TIMBER, GENERAL

- A. General: Comply with DOC PS 20 and grading rules of lumber grading agencies certified by American Lumber Standards Committee Board of Review, as applicable.

1. Factory mark each item of timber with grade stamp of grading agency.
2. For exposed timber indicated to receive a stained or natural finish, apply grade stamps to surfaces that will not be exposed to view or omit grade stamps and provide certificates of grade compliance issued by grading agency.

2.2 TIMBER

- A. Timber Species and Grade:
 1. Architect to select from the following:
 - a. Douglas fir-larch, Hem-fir or Western Red Cedar.
- B. Moisture Content: Provide timber with 19 percent maximum moisture content at time of dressing.
- C. Dressing: Provide timber that is rough sawn (Rgh).
- D. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts.
- E. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.3 TIMBER CONNECTORS

- A. General: Unless otherwise indicated, fabricate from the following materials:
 1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.
 2. Round steel bars complying with ASTM A 575, Grade M 1020.
 3. Hot-rolled steel sheet complying with ASTM A 1011, Structural Steel, Type SS, Grade 33.
- B. Provide bolts, 3/4 inch (19 mm), unless otherwise indicated, complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); nuts complying with ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Provide shear plates, size per Architect/Engineer, complying with ASTM D 5933.
- D. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil (0.05-mm) dry film thickness.
- E. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

2.4 FABRICATION

- A. Shop fabricate members by cutting and restoring exposed surfaces to match specified surfacing. Predrill for fasteners and assembly of units.
 1. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
- B. Seal Coat: After fabricating and surfacing each unit, apply a saturation coat of penetrating sealer on surfaces of each unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Erect heavy timber construction true and plumb. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
- B. Fit members by cutting and restoring exposed surfaces to match specified surfacing. Pre-drill for fasteners and assembly of units.
 - 1. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
 - 2. Coat crosscuts with end sealer.
- C. Install timber connectors as indicated.
 - 1. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.
- D. Repair damaged surfaces and finishes after completing erection. Replace damaged heavy timber construction if repairs are not approved by Architect.

END OF SECTION 06130

SECTION 06160 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. Gypsum sheathing attached to steel framing members of exterior walls and soffits.
2. Sheathing joint-and-penetration treatment.

1.2 RELATED SECTIONS

- A. See Section 05400 Cold-Formed Metal Framing for framing systems.
- B. See Section 09250 Gypsum Board for interior gypsum board systems.
- C. See Section 07210 for exterior extruded polystyrene board insulation.
- D. See Section 07411 for Metal Wall Panels installed over sheathing.
- E. See Section 09220 for Cement Stucco Systems installed over sheathing.

1.2 SUBMITTALS

- F. Product Data: For each type of product specified.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: Where gypsum sheathing boards are part of fire-resistance-rated assemblies, provide assemblies as follows:
 1. Assemblies comply with requirements of fire-response-tested assemblies indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual"; or by design designations in UL's "Fire Resistance Directory" or in certification listings of another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Fire-resistance ratings were determined by fire-response testing assemblies according to ASTM E 119.

PART 2 - PRODUCTS

2.1 GYPSUM SHEATHING BOARD

- A. Glass-Mat Gypsum Board: Gypsum board designed as an exterior substrate for a weather barrier, consisting of a noncombustible water-resistant core, essentially gypsum, surfaced with glass mats on face and back, partially or completely embedded in core, and with unsurfaced square edges. Comply with ASTM C 1177 and requirements indicated below:
 1. Type and Thickness: Type X, 5/8-inch thick as indicated on the Drawings.
- B. Products: Subject to compliance with requirements, provide the following:

2. Glass-Mat Gypsum Board, Type X: Dens-Glass Gold Firestop; Georgia-Pacific Corp. (Basis-of-Design)
- C. Sheathing Fasteners: ASTM C 954, steel drill screws, Type S-12 fluted tip, a minimum of 1-1/4 inches (32 mm) long, with organic-polymer coating or other corrosion-protective coating.

2.2 ACCESSORY MATERIALS

- A. Fasteners: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117, and as follows:
 1. Provide steel drill screws complying with ASTM C 1002 to attach sheathing to steel framing less than 0.0329 inch (0.835 mm) thick.
- B. Elastomeric Sealant: Medium-modulus, neutral-curing silicone 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 Division 7 Section "Joint Sealants."
- C. Silicone Emulsion Sealant for Glass-Mat Gypsum Sheathing: Product complying with ASTM C 834, compatible with sheathing tape and gypsum sheathing, recommended by sheathing and tape manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 1. Product: Subject to compliance with requirements, provide "Elmer's Siliconized Acrylic Latex Caulk" by Borden, Inc. (Basis-of-Design)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.
- B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch (9-mm) setback where non-load-bearing construction abuts structural elements.
- C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
- D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
- E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
- F. Horizontal Installation: Install 24-inch- (610-mm-) wide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud as follows:
- G. Vertical Installation: Install 48-inch- (1219-mm-) wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud as follows:

1. Fasteners spaced approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9 mm) from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.2 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.
- B. Sealing Sheathing Joints: Seal joints according to sheathing manufacturer's written recommendations and as follows:
1. Apply elastomeric sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 2. Apply manufacturer-recommended tape to top of sealed joints, as required to achieve a complete, waterproof barrier.

3.3 FLEXIBLE FLASHING INSTALLATION

- C. Apply flexible flashing where indicated to comply with manufacturers written instructions.
1. Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
 2. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 3. Lap weather-resistant building paper over flashing at heads of openings.
 4. After flashing has been applied, roll surfaces with a hard rubber or metal roller.

END OF SECTION 06160

SECTION 06410 - CUSTOM CASEWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Shop fabricate, finish and install custom casework.
- B. Casework Includes:
 - 1. Custom Fabricated Cabinet Units
 - 2. Countertops
 - 3. Shelving
 - 4. Hardware and Accessories
 - 5. Shelf and Countertop Supports

1.2 RELATED WORK

- A. Division 6:
 - 1. Solid Polymer Fabrications

1.3 REFERENCE STANDARDS

- A. Workmanship: The Quality Standards of the AWI, (Architectural Woodwork Institute) Custom Grade shall apply and by reference are hereby made a part of this specification unless otherwise noted.
- B. Competence:
 - 1. The approved woodwork manufacturer must have a minimum of three years of documented experience specializing in the Work of this Section, must have a reputation for doing satisfactory work on time, and shall have successfully completed comparable work. The A/E has the right to approve the woodwork manufacturer selected.
 - 2. Installer shall be trained in the methods and skilled in the installation of woodwork.
- C. Standards for Materials:
 - 1. Particleboard: ANSI 208.1
 - 2. Softwood plywood: US Product Standards PS1
 - 3. Hardwood plywood: ANSI-HPVA, Hardwood Plywood and Veneer Association
 - 4. Hardboard: ANSI-AHA 135.484 American Hardboard Association
 - 5. National Electric Manufacturers Association (NEMA): High Pressure Decorative Laminates
 - 6. PVA Adhesive (polyvinyl acetate) white glue, Type III – ASTM-D3110
 - 7. Aliphatic Adhesive (carpenters glue) Type II – ASTM-D3110
 - 8. Solvent based contact cement: MMM-A-J130B
 - 9. ANSI/BHMA A156.9: Cabinet Hardware

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Show casework elevations, plans, cross sections and installation details. Note surface finishes, materials, dimensions, sinks, fittings, hardware, supports and other accessories.
 - 2. Locate equipment for guidance of other trades.
 - 3. Show connections of cases to each other and adjacent work.

4. Keying schedule for review and approval by the Owner. Include Grand Masterkey for all locks, Masterkey for each room or area unless specifically noted to be individually keyed; i.e. personnel lockers, personal drawers, cash drawers

B. Samples:

1. Laminates shall be selected by the A/E from the standard line offered by Wilsonart, Formica and Nevamar.
2. Contractor shall submit to A/E:
 - a. Standard wood veneer samples and wood finishes from which the A/E will make a selection.
 - b. Catalog cut sheets for cabinet hardware and accessories.

1.5 FIELD MEASUREMENTS

- A. Verify dimensions of cabinet, countertop and shelf locations on site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect surfaces subject to damage while in transit.
- B. Deliver only when building is completely enclosed and heated and wet-type construction is finished.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.

1.8 DEFINITIONS

A. Exposed Portions:

1. Surfaces visible when doors and drawers are closed including interiors of open cabinets.
2. Cabinet tops less than 72" above finish floor, or greater than 72" above finish floor if visible from an upper building level, and sloping cabinet tops.
3. Visible edges of cabinet ends, door and drawer fronts.

B. Semi-Exposed Portions:

1. Surfaces visible when doors and drawers are open including interior faces of hinged doors.
2. The underside bottoms of wall hung cabinets.
3. The visible surfaces in open cabinets or behind glass doors.
4. Visible portions of bottoms, tops, and ends in front of sliding doors in closed position.
5. Front and back edges of adjustable shelves.

C. Concealed Portions:

1. Toe space unless otherwise noted.
2. Sleepers
3. Web frames, stretchers.
4. Security panels.
5. Underside of bottoms of cabinets less than 30" above the finished floor.
6. Flat tops of cabinets 72" or more above the finished floor, except if visible from an upper building level.
7. The underside of countertops, knee spaces and drawer aprons.
8. Faces of cabinet ends of adjoining units that butt together.

PART 2 - PRODUCTS

2.1 PLASTIC LAMINATED CASEWORK

A. Casework Exposed Portions:

1. Exposed material shall be patterns and colors as selected by the A/E.
2. High pressure laminates, laminated with PVA adhesive under 50 PSI pressure, meeting NEMA LD-3 standards.
3. Provide general purpose grade plastic laminate in the following thickness:
 - a. Horizontal Grade .050" = GP50
 - b. Vertical Grade .028" = VG28
 - c. Postforming Grade .042" = PF42
 - d. Cabinet Linear Grade .020" = CL20
 - e. Chemical Resistant Grade .036"
4. Decorative laminate manufacturers include:
 - a. Formica
 - b. Wilsonart
 - c. Nevamar
5. Woodgrain patterns shall run vertically on doors, ends and fixed panels, and horizontally on drawer fronts and sink fronts unless noted otherwise.

B. Semi-Exposed Portions:

1. Semi-exposed material shall be one of the following at the contractor's option, unless otherwise specified on the Drawings.
2. Low pressure thermofused melamine or polyester laminate achieved through self-bonding of the resin under 300 PSI at 320 degrees, meeting ALA standards.
3. High pressure plastic laminate at .028" thickness, laminated with PVA adhesive under 50 PSI pressure, meeting NEMA LD-3 standards.
4. Color shall be consistent throughout semi-exposed surfaces and shall be almond or white as selected by the A/E.
5. Interior faces of cabinet doors, drawer fronts and finished ends are to be laminated with high pressure plastic laminate, color to match cabinet interior.
6. Interior faces of tops, bottoms, ends, partitions and shelves shall be overlaid with low pressure thermofused melamine.
7. Cabinet backs and drawer bottoms shall have factory applied coating to both faces. Interior face to match cabinet interior color.
8. Small vertical or horizontal dividers shall be ¼" thick tempered hardboard where noted on the Drawings.

C. Concealed Portions, Cores, and Substrates:

1. Concealed materials shall be any species or sound dry solid stock, plywood, particleboard, medium density fiberboard, or a combination thereof.
2. Materials shall be securely glued with Type II adhesive.
3. Laminate core material shall be 45 lb density composition premium grade particleboard or AB exterior rotary cut Douglas fir plywood as specified herein.

D. Visible Edges, Exposed and Semi-Exposed:

1. Exposed edges of cabinet ends, doors and drawer fronts shall be edgebanded with .018" PVC, color to be selected by the A/E or match the existing face color if contrasting edgeband is not specified on the Drawings.
2. Exposed edges of cabinet shelves, sub-tops, bottoms and partitions shall be edgebanded with .024" PVC to match cabinet interior.
3. Edges at underside of upper cabinets and drawer parts shall be edgebanded with .024" PVC to match cabinet interior.

2.2 PLASTIC LAMINATED CASEWORK CONSTRUCTION

A. Drawers:

1. Drawer fronts shall be 11/16" thick particle board overlaid with high pressure laminate on both faces equal to 3/4" thickness. Inside color shall match drawer interior.
2. Drawer sides shall be 1/2" thick particle board overlaid with thermofused melamine on two sides to match cabinet interior. Drawer parts shall be joined together with hardwood dowels.
3. Drawer bottoms, subfronts and backs shall be 1/2" particle board, bottoms tongued into backs and sides, glued and clamped to produce a rigid drawer.
4. Drawers shall be mounted with positive "in" and "out" stops to provide permanent and quiet operation. Drawer fronts that impact cabinet body shall not be allowed.
5. Drawers shall have ball bearing slides as specified.
6. Full depth security panel shall be provided between drawers when individual drawer locking is required.

B. Doors:

1. Doors shall be 11/16" thick particle board overlaid with high pressure laminate equal to 3/4" thickness. Inside faces shall match cabinet interior.

C. Cabinet Ends:

1. Exposed or finished ends shall be 11/16" thick particle board overlaid with high pressure laminate on both faces equal to 3/4" thickness. Inside faces shall match cabinet interior.
2. Semi-exposed ends shall be 3/4" particle board overlaid with thermofused melamine on both faces.
3. Ends shall be drilled for adjustable shelf supports with 5mm holes on 1" centers.

D. Cabinet Tops and Bottoms:

1. Semi-exposed ends shall be 3/4" particle board overlaid with thermofused melamine on both faces.
2. Exposed or finished ends shall be 11/16" thick particle board overlaid with high pressure laminate on both faces equal to 3/4" thickness. Inside faces shall match cabinet interior.

E. Fixed and Adjustable Shelves:

1. Shelves shall be designed to support uniform loading of up to 50lb/sf with no more than .080" per lineal foot deflection of unsupported span.
2. Spans up to 31" shall be 3/4" particle board overlaid with thermofused melamine on both faces.
3. Spans over 31" and up to 41" long shall be 1" thick particle board overlaid with thermofused melamine on both faces.
4. Spans over 41" to 48" long shall be 1" plywood core overlaid with thermofused melamine on both faces.
5. Spans over 48" are not permitted.
6. Adjustable shelves shall be supported on 4 shelf clips up to 21" deep, and 6 shelf clips at 22" deep and over.
7. Adjustable shelves for wall-mounted standards shall be 1" thick particle board overlaid with thermofused melamine on both faces and edged banded on four edges.

F. Cabinet Backs:

1. Semi-exposed backs shall be 1/2" particle board with thermofused melamine on exposed faces.
2. Exposed backs shall be 11/16" thick particle board overlaid with high pressure laminate on both faces equal to 3/4" thickness, inside color to match cabinet interior.

G. Cabinet Bases:

1. Cabinet bases shall be 4" standard height made in continuous lengths to ensure straight, level and true line of casework. Base material is 3/4" particle board unless otherwise noted.

H. Filler Panels:

1. Panels shall be of 11/16" thick particle board overlaid with high pressure laminate on both faces to equal to 3/4" thick and be fitted to adjacent surfaces.
2. Exposed faces shall have laminate matching adjacent cabinets.

2.3 WOOD CASEWORK FOR TRANSPARENT FINISH

- A. Construction shall be for grade Custom in accordance with AWI.
- B. Panel and lumber products for grade custom in accordance with AWI:
 - 1. Exposed panel products: "A" face veneer core particle or plywood where noted.
 - 2. Blending of panel products across multiple cabinet faces in one elevation: warehouse stock panels blended for figure and color consistency.
 - 3. Direction and matching of wood grain on individual cabinet: Continuous vertical figure across doors of individual cabinet. Drawer fronts may be horizontal or vertical.
 - 4. Exposed solid lumber parts: Grade II, same species as adjacent face veneer on panel product unless otherwise specified.
 - 5. Semi-exposed parts not including drawer bodies: Thermoset decorative overlay, solid color melamine or Grade II solid lumber, compatible species to exposed.
 - 6. Concealed Parts: Mill option
- C. Type of Cabinet Construction: Flush Overlay
- D. Hardwood Species for Exposed Surfaces:
 - 1. White Birch
 - 2. Cut: Plain Sliced
- E. Material Thickness and Joinery:
 - 1. Cabinet Door and Drawer Fronts: ¾" minimum nominal thickness.
 - 2. Body members:
 - a. ¾" panel product, splined or bisquited, glued under pressure.
 - b. Ends shall be drilled for adjustable shelf supports with 5mm holes on 1" centers.
 - 3. Back panels: ¼" panel product, side bound, captured in grooves on cabinet back, glued and pinned.
 - 4. Mounting or hanger strips: ½" Lumber or panel product.
 - 5. Drawers:
 - a. Sides, backs and subfronts: 1/2" lumber or panel product.
 - b. Bottoms: ¼" panel product.
 - c. Drawers shall be mounted with positive "in" and "out" stops to provide permanent and quiet operation.
 - d. Drawer fronts that impact cabinet body shall not be allowed.
 - e. All drawers shall have ball bearing slides as specified.
 - f. Full depth security panel shall be provided between drawers when individual drawer locking is required.
 - 6. Shelves:
 - a. ¾" veneer core plywood for spans up to 36 inches.
 - b. 1" veneer core plywood for spans up to 48 inches.
 - c. Adjustable shelves shall be supported on 4 shelf clips up to 21" deep, and 6 shelf clips at 22" deep and over.
- F. Edge Treatment of Exposed and Semi-Exposed Panel Products:
 - 1. Body Members: 1/50" same species as face.
 - 2. Exposed Shelves: 1/50" same species as face.
 - 3. Semi-exposed Shelves: 1/50" compatible with interior.
 - 4. Door and Drawer Fronts: 1/50" same species as face.
- G. Finishing: Mill finish casework in accordance with AWI Division 1500-S-4 Finish System Standards:
 - 1. Sand work smooth, set exposed fasteners, and apply wood filler in exposed indentations.
 - 2. Finish to be water based stain and ultraviolet (UV) cured polyurethane sealer to comply with EPA Title 5 guidelines for Volatile Organic Compounds (VOC) emissions limitations.
 - 3. Finish must meet or exceed performance standards of TR-6 catalyzed polyurethane.
 - 4. Color shall be as selected by the A/E from manufacturer's standard colors

2.4 COUNTERTOPS

- A. Decorative laminate countertops shall be GP50 NEMA grade laminate with .020" backing sheet bonded to ¾" particleboard substrate.
1. ¾" thick plywood shall be used in areas of prolonged high humidity.
 2. Overall thickness of finished edges shall be 1 ½" with build-up added to the substrate.
 3. Backsplashes shall be ¾" thick and 4" high unless otherwise specified and assembled with waterproof sealant and #6 x 2" screws at 6" oc.

2.5 HARDWARE AND ACCESSORIES

- A. Supply product listed or submit equivalent product as a "substitution" through process outlined in Division 1.
1. Hinges: Concealed Blum Modul 170, typical and Blum Clip where accessible or removable are noted on the Drawings.
 2. Wire Pulls: Doors and Drawers: Amerock 867 Series Brushed Steel.
 3. Catches: Magnetic, Lawrence #SC-1364, or approved 7 lb. pull rating.
 4. Heavy-Duty 12-GA Standards and Shelf Brackets: K&V #87 Standards, K&V #187 Brackets.
 5. Light to Medium Duty Drawer Slides on Max. 24" Wide Drawers: Accuride 7432 ball bearing, rail-mount, full-extension slides, 100 lb/pr load rating.
 6. Heavy Duty Drawer Slides on Max. 24" Wide Drawers: Accuride 4032 ball bearing, rail-mount, full-extension slides, 150 lb/pr load rating.
 7. Heavy Duty Storage Drawer Slides on Max. 30" Wide Drawers: Accuride 3640 ball bearing, rail-mount, full-extension slides, 200 lb/pr load rating.
 8. Retracting Door Hardware: Accuride 1155
 9. Articulating Keyboard Tray with Mousepad Tray: Ergo Charleston by Ergo Systems, 410 Prospect St, East Hartford, CT 06108 (860) 282-9767. Keyboard and mousepad trays shall be constructed of vinyl covered wood core platforms with rounded edges with standard palm supports.
 10. Countertop Support Brackets: Shall be constructed of 16 ga, 1½" tube steel with welded construction designed to support countertops off finished wall at heights indicated on the drawings, ground smooth, primed.
 - a. 18" x 21" for up to 26" deep countertops.
 - b. 21" x 27" for up to 32" deep countertops.
 11. Adjustable Shelf Standard and Supports: K&V #255 standards, K&V #256 clips, or series of holes at 1-1/4" maximum with metal shelf clip (6 per shelf) at mill option.
 12. Wire Grommets: Provide with removable and adjustable caps in color selected by the A/E from manufacturer's standard color selection, 2 3/8" diameter, Hafele #429.99-60mm.
 13. Ten-compartment plastic cash tray for drawers 15 x 9 x 1 5/8, Buddy Products BDY5334 (1-800-886-8688).
 14. National Disc Tumbler Door and Drawer Lock, Surface Mounted, Dead bolt-type where indicated on the Drawings. Finish shall match door and drawer pulls.
- B. Accessories
1. Adhesive for High Pressure Decorative Laminates: Type recommended by laminate manufacturer to suit application.
 2. Fasteners: Size and type to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.

- B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. General:

1. Components shall be neatly assembled and clamped together with adhesive, dowels, screws and other fasteners to form a complete system.
2. Casework shall be installed in accordance with AWI Custom Grade Quality Standards.

B. Attachment:

1. Set casework accurately in place, level, scribe, and secure to floor or walls.
2. Primary anchorage of base and wall cabinets shall be through the ½" thick cabinet backs into the wall framing or blocking furnished under other sections.
3. Additional anchorage will be made into cabinet bases and adjacent side walls where they occur.
4. Installations shall be in strict accordance with seismic codes.
5. At free-standing countertops and work surfaces, steel support brackets shall be provided at a maximum spacing of 32" oc or less if shown on the drawings. Support brackets shall be designed to allow for knee space clearance and attach to wall framing for support.

C. Workmanship:

1. Erect casework straight, level, plumb and true.
2. Neatly scribe casework to walls, soffits and columns. Fillers to color match adjacent surfaces and will not be permitted in excess of 1 ½" wide unless specified otherwise.
3. Joints are not permitted in continuous countertops. Joints, where approved, are to be tight, in perfect alignment, and not allowing excessive deflection.

D. Coordination:

1. Provide cutting and fitting as necessary to accommodate mechanical, plumbing and electrical work built into casework units.
2. Provide alterations to casework to keep control devices accessible when they are covered by casework including electrical and data/comm receptacles. Alert Contractor when installation of casework will conceal electrical and mechanical devices

3.3 CLEAN AND ADJUST

- A. Install items complete with accessories.
- B. Adjust moving parts to operate properly.
- C. Leave surfaces clean and free from debris at time of final acceptance.

END OF SECTION 06410

SECTION 06611 - SOLID POLYMER FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Described in this Section:
 - 1. Standard Countertops
 - 2. Countertops with sinks

- B. Related Work Specified Elsewhere:
 - 1. Casework, and supports for countertops
 - 2. Plumbing

1.2 REFERENCES

- A. Applicable Standards: Standards of the following, as referenced herein:
 - 1. American National Standards Institute (ANSI)
 - 2. American Society for Testing and Materials (ASTM)
 - 3. National Electrical Manufacturers Association (NEMA) LD
 - 4. High Pressure Decorative Laminates

1.3 SUBMITTALS

- A. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.

- B. Samples: Submit minimum 2" x 2" samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.

- C. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.

- D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.4 QUALITY ASSURANCE

- A. Allowable Tolerances:
 - 1. Variation in component size: $\pm 1/8$ "
 - 2. Location of openings: $\pm 1/8$ " from indicated location.

- B. Installer Qualifications:
 - 1. Installation of solid polymer components shall be by a firm that is authorized by the solid polymer manufacturer to fabricate and install the solid polymer components.
 - 2. Installation firm shall demonstrate by references, experience in installing finished items similar in type and quality to those required for this project.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.6 WARRANTY

- A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials.

PART 2 - PRODUCTS

2.1 SOLID POLYMER FABRICATIONS

- A. Wherever solid surfacing, homogeneous plastic or solid polymer is indicated on the Drawings, the material specified herein shall be incorporated.
 - 1. Product is manufactured under such trade names as:
 - a. Corian Solid Surfaces
 - b. Formica Solid Surfacing
 - c. LG HiMacs Acrylic Solid Surface
 - d. WilsonArt Solid Surface
 - 2. Equivalent product may be submitted under the provisions of Product Requirements section.
- B. Material: Homogeneous blend of acrylic or polyester alloys and fillers; not coated, laminated or of composite construction with color and pattern extending throughout the material; meeting ANSI Z124.3 & .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
 - 1. Material shall have minimum physical and performance properties specified.
 - 2. Superficial damage to a depth of 0.010" shall be repairable by sanding and polishing.
- C. Standard Countertops: Horizontal surfaces of 1/2" thick solid polymer material adhesively joined with inconspicuous seams; edge details as indicated on the Drawings. Vertical surfaces shall be 1/2" material as shown on the Drawings.
- D. Countertops with Sinks and Lavatories: 1/2" thick countertop of solid polymer material; edge details as indicated on the Drawings, complete with sink as shown on the Drawings. Provide counter complete with backsplash of size shown on the Drawings.

2.2 PERFORMANCE CHARACTERISTICS

<u>PROPERTY</u>	<u>REQUIREMENT</u>	<u>TEST PROCEDURE</u>
Tensile Strength	4200 psi min.	ASTM D638
Tensile Modulus	1.0 x 10 ⁶ psi min.	ASTM D638
Flexural Strength	7000 psi min.	ASTM D790
Flexural Modulus	1.0 x 10 ⁶ psi min.	ASTM D790
Elongation	0.3% min.	ASTM D638
Hardness	52-Barcol Impresser min.	ASTM D2583
Thermal Expansion	1.95 x 10 ⁻⁶ in/in/deg F. max.	ASTM D696
Color Stability	No change, 100 hours min.	NEMA LD3-3.10
Wear and Cleanability	Passes	ANSI Z124.3
Abrasion Resistance	(1000cycles) =0.9g.	NEMA LD3-3.1

ASTM C501			
Boiling water resistance	No Change		NEMA LD3-3.5
High temperature resistance	No Change		NEMA LD3-3.6
Impact Resistance - Izod	0.24 ft.-lbs.min		ASTM D256
<u>Ball drop</u>			
1/4" sheet	36" min., 1/2 lb. ball, no failure		NEMA LD3-3.3
1/2" sheet	140" min., 1/2 lb. ball, no failure		
3/4" sheet	200" min., 1/2 lb. ball, no failure		
Stain Resistance	Passes		NEMA LD3-3.9
Weatherability	No change,min. 1000 hours		ASTM D1499
Fungi and Bacteria	No Attack ASTM G21 & G22		
Specific Gravity	1.6 min.		
Water Absorption in 24 hrs.	0.05 (1/4"), 0.10 (3/4")		ASTM D570
<u>Flammability</u>			<u>ASTM E84</u>
Flame Spread	25 max.	25 max.	25 max.
Smoke Developed	30 max.	30 max.	30 max.
Flame Spread Class	1	1	1

2.3 ACCESSORY PRODUCTS

- A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond.
- B. Sink/Bowl Mounting Hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

2.4 FABRICATION

- A. For warranty coverage, fabricator/installer shall be approved by solid polymer manufacturer.
- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements.
- C. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" wide reinforcing strip of solid polymer material under each joint.
- D. Provide holes and cutouts for plumbing accessories as indicated on the Drawings.
- E. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.
- F. Finish: All surfaces shall have uniform finish:
 - 1. Semigloss, with a gloss rating of 25 – 50.
- G. Backsplashes: Fabricate 1/2" back and side splashes where shown on the drawings

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawings and product installation details.

- B. Provide horizontal surface supports every 18". Do not use full wood underlayment for horizontal applications.
- C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- D. Install backsplashes and endsplashes as indicated on the Drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant.
- E. Adhere undermount/submount/bevel mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
- F. Adhere topmount sinks/bowls to countertops using manufacturer recommended adhesives and color-matched silicone sealant.
- G. Make plumbing connections to sinks in accordance with Division 22.

3.2 CLEANING AND PROTECTION

- A. Keep components and hands clean during installation. Remove adhesives, sealants and other stains
- B. At completion of work, remove excess material, dirt, dust, trash and other materials resulting from installation. Clean surfaces, remove labels and leave area clean.
- C. Protect surfaces from damage until Date of Substantial Completion.
 - 1. Place temporary covers over sinks to preclude their use for construction purposes.
 - 2. Repair or replace damaged work that cannot be repaired to A/E's satisfaction.

END OF SECTION 06611

SECTION 07141 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cold-applied asphalt modified polyurethane waterproofing.
- B. Related Work
 - 1. Division 9 Tiling: for installation of floor tile in thin-set bed over waterproof membrane

1.2 PERFORMANCE REQUIREMENTS

- A. Provide waterproofing membrane that prevents the passage of water.

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- D. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is authorized by waterproofing manufacturer to install manufacturer's products.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, 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 waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.
 - 1. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.7 WARRANTY

- A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer and Installer, agreeing to repair or replace waterproofing that does not comply with requirements or that does not remain watertight within specified warranty period.
 - 1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/16 inch (1.6 mm) in width.
 - 2. Warranty Period: 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following products:
 - 1. Cold-Applied Asphalt Modified Polyurethane Waterproofing Membrane:
 - a. HLM-5000, Sonneborn/ChemRex, Inc., (Basis-of-Design)
 - 2. Drainage Panels:
 - a. Sonoshield DBS 6200, Sonneborn/ChemRex, Inc.
 - b. Enkadrain, Colbond Geosynthetics
 - c. Or equal approved by Architect.

2.2 WATERPROOFING MATERIALS

- A. General: Provide waterproofing materials recommended by manufacturer to be compatible with one another and able to develop bond to substrate under conditions of service and application, as demonstrated by waterproofing manufacturer based on testing and field experience.
 - 1. Produce waterproofing materials suitable for application to vertical, horizontal, and sloped substrates, as applicable.
 - 2. Provide waterproofing materials with not less than 90 percent solids.
- B. Cold Fluid-Applied Waterproofing: Comply with ASTM C 836, with manufacturer's written physical requirements, and as follows:

1. Single component, cold-applied asphalt modified polyurethane waterproofing membrane.

2.3 AUXILIARY MATERIALS

- A. Primer: Manufacturer's standard, factory-formulated polyurethane or epoxy primer.
- B. Sheet Flashing: 50-mil- (1.3-mm-) minimum, nonstaining uncured sheet neoprene.
 1. Adhesive: Manufacturer's recommended contact adhesive.
- C. Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.
- D. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing, complying with ASTM C 920 Type M, Class 25; Grade NS for sloping and vertical applications or Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.
 1. Backer Rod: Closed-cell polyethylene foam.
- E. Protection Course: Semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
 1. Thickness: As indicated on Drawings.
 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Molded-Sheet Drainage Panel: Prefabricated, composite drainage panels, manufactured with a permeable geotextile facing laminated to a molded-plastic-sheet drainage core.
 1. Drainage Core: Three-dimensional, nonbiodegradable, molded-plastic-sheet material designed to effectively drain water under backfill pressure; complying with the following properties determined according to tests indicated:
 - a. Compressive Strength: minimum; ASTM D 1621.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage or overspray affecting other construction.
- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.
- D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 PREPARATION AT TERMINATIONS AND PENETRATIONS

- A. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and manufacturer's written instructions.
- B. Prime substrate, unless otherwise instructed by waterproofing manufacturer.
- C. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat when recommended by waterproofing manufacturer.
 - 1. Provide sealant cants around penetrations and at inside corners of deck-to-wall butt joints when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
 - 1. Comply with ASTM C 1193 for joint-sealant installation.
 - 2. Apply bond breaker between sealant and preparation strip.
 - 3. Prime substrate and apply a single thickness of preparation strip extending a minimum of 3 inches (75 mm) along each side of joint. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat.
- B. Install sheet flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's written instructions.
 - 1. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate according to ASTM C 898.

3.5 WATERPROOFING APPLICATION

- A. Apply waterproofing according to ASTM C 898 and manufacturer's written instructions.
- B. Start installing waterproofing in presence of manufacturer's technical representative.

- C. Apply primer over prepared substrate.
- D. Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
 - 1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils (1.5 mm) and a minimum dry film thickness of 50 mils (1.3 mm) at any point.
 - 2. Apply waterproofing to prepared wall terminations and vertical surfaces.
 - 3. Verify wet film thickness of waterproofing every 100 sq. ft. (9.3 sq. m).
- E. Install protection course with butted joints over nominally cured membrane before starting subsequent construction operations.
 - 1. Molded-sheet drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels to substrate according to manufacturer's written instructions. Use adhesives or mechanical fasteners that do not penetrate waterproofing. Protect installed molded-sheet drainage panels during subsequent construction.
 - 1. For vertical applications, install board insulation used as a protection course before installing drainage panels.

3.7 CURING, PROTECTING, AND CLEANING

- A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
 - 1. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed drainage panels from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07141

SECTION 07210 – BUILDING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section specifies thermal and acoustical insulation for buildings
 - 1. Acoustical insulation is identified by thickness and words "Acoustical Insulation".
- B. Related Sections:
 - 1. Division 3 Concrete – Underslab Vapor Barrier
 - 2. Division 4
 - a. Unit Masonry
 - b. Architectural Masonry
 - 3. Division 7
 - a. Dampproofing
 - b. Waterproofing
 - c. Metal Roofing and Wall Paneling Systems: Section includes roof insulation
 - d. Thermoplastic Membrane Roofing: Section includes roof insulation

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C553 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
 - 2. ASTM C578 Rigid, Cellular Polystyrene Thermal Insulation
 - 3. ASTM C665 Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
 - 4. ASTM E84, Surface Burning Characteristics of Building Materials

1.3 SUBMITTALS

- A. Product Data for each type of insulation used
- B. Manufacturer's Installation Instructions

1.4 STORAGE AND HANDLING

- A. Store insulation materials in weathertight enclosure.
- B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Insulation:
1. Dow Chemical Co.
 2. Firestone Building Products
 3. GAF Materials Corporation
 4. Owens Corning
 5. TAILORED Chemical Products, Inc
 6. Approved Equal
- B. Adhesive:
1. ChemRex, Inc. Contech Brands PL300 Foam Board Adhesive
 2. Dacar Products, Inc. Foamgrab PS

2.2 MATERIALS

- A. Insulation – General:
1. Thermal Resistance (R-Value) for insulation installed in the following areas shall have the following values:
 - a. Exterior Walls: Average of R-19. Note: Masonry wall assembly R-value consists of insulated masonry, rigid insulation and metal wall paneling.
 - b. Perimeter Foundation: R-8
 - c. Roof Assembly: Average of R-30. Insulation specified in Metal Roofing and TPO Sections
- B. Rigid Insulation:
1. ASTM C578 Type IV for perimeter/foundation and masonry wall sheathing:
 - a. Rigid closed cell extruded polystyrene thermal board insulation
 - b. Thermal resistance “R” per inch 5.0 minimum
 - c. Compressive strength 25 psi
 - d. Water absorption: Max 0.1% by volume (ASTM C 272)
 - e. Square edges
- C. Exterior Wall Batts:
1. Mineral Fiber: ASTM C665, Type II, Class C, Category I where framing is faced with gypsum board.
 2. Mineral Fiber: ASTM C665, Type III, Class A, where framing is not faced with gypsum board and insulation is exposed to space
 - a. Flame Spread 25 (ASTM E84)
 - b. Smoke Developed 50 (ASTM E84)
 - c. Permeance: 0.5 perms (ASTM E96)
- D. Masonry Foam Insulation: Core-Fill 500, a two-component system consisting of amino-plast resin and a catalyst foaming agent surfactant propelled by compressed air.
1. Fire Safety: Flame Spread not to exceed 25, smoke developed – 5, fuel contribution – 0
 2. Fire Rating: Class A
 3. Water Absorption: Floating Test 3%
 4. R-Value: 4.9 per inch
 - a. 8” block/100 lbs density = 9.1
 - b. 12” block/100 lbs density = 12.5)

- E. Interior Acoustical Insulation/Sound Attenuation Batts:
1. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semi-rigid (4.5 pound nominal density).
 2. Mineral Fiber Batt or Blankets: ASTM C665. Maximum flame spread of 25 and smoke development of 450 when tested in accordance with ASTM E84.
 3. Thickness 3" unless otherwise shown on the drawings; and of widths and lengths to fit tight against framing.
- F. Accessories:
1. Adhesive: Type recommended by insulation manufacturer
 2. Nails or Staples: Steel wire, electroplated or galvanized; type and size to suit application.
 3. Tape: As recommended by insulation manufacturer.
 4. Fasteners:
 - a. Staples or Nails: ASTM F1667, zinc-coated, size and type best suited for purpose.
 - b. Screws: ASTM C954 or C1002, size and length best suited for purpose with washer not less than 50 mm (two inches) in diameter.
 - c. Impaling Pins: Steel pins with head not less than 50 mm (two inches) in diameter with adhesive for anchorage to substrate. Provide impaling pins of length to extend beyond insulation and retain cap washer when washer is placed on the pin.
 - d. As recommended by the manufacturer of the insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Preparation for Perimeter Insulation:
1. Verify substrate and adjacent materials and insulation boards are dry and ready to receive insulation and adhesive.
 2. Verify substrate surface is flat, free of irregularities and materials that will impede adhesive bond.
 3. Verify insulation boards are unbroken, free of damage.
- B. Perimeter Insulation:
1. Install in full conformance with manufacturer's instructions and recommendations.
 2. Where insulation is to be installed on exterior face of foundation wall, install insulation boards over dampproofing or waterproofing specified in other sections.
 3. Where insulation is to be installed on interior face of foundation wall, install vapor barrier between soil and insulation.
 4. Install boards on foundation wall in a method to maximize contact bedding; stagger joints. Butt edges and ends tight to adjacent board and to protrusions. Assure full contact of tongue and groove edges.
 5. Install rigid insulating units with joints close and flush, in regular courses and with cross joints broken.
 6. Where insulation is installed on exterior face of foundation wall, adhere protection boards immediately following insulation board installation.
- C. EPS Wall Insulation:
1. Verify that masonry joints are struck flush and that other conditions are satisfactory for proper installation.
 2. Remove concrete fins and mortar projections that interfere with placement of insulation boards.
 3. Coordinate installation with metal wall paneling.
 4. Apply 2" diameter daubs of adhesive spaced approximately 12" oc both ways on inside face of insulation board.
 5. Fit insulation between panel clips and other obstructions.
 6. Press units firmly against masonry. Make insulation continuous. Fill voids.

- D. Exterior Framing or Furring Thermal Batt Insulation:
1. Install vapor/air barrier when noted on the drawings. Install faced insulation with the vapor retarder facing the heated side, unless specified otherwise.
 2. Install batt or blanket insulation in exterior walls, roof, and ceiling spaces from wall-to-wall without gaps or voids with tight joints and filling framing void.
 3. Pack insulation around door frames and windows and in building expansion joints, door soffits and other voids. Pack behind outlets around pipes, ducts, and services encased in walls. Open voids are not permitted. Hold insulation in place with pressure sensitive tape.
 4. Lap vapor retarder flanges together over face of framing for continuous surface. Seal all penetrations through the insulation.
 5. Fasten blanket insulation between metal studs or framing and exterior wall furring by continuous pressure sensitive tape along flanged edges.
 6. Fasten blanket insulation between wood studs or framing with nails or staples through flanged edges on face of stud. Space fastenings not more than six inches apart.
- E. Masonry Foam Insulation:
1. Foam insulation shall be installed by certified applicators and in accordance with manufacturer's methods.
 2. Place after masonry materials have sufficiently dried and attained optimum moisture content.
 3. Verify holes and openings have been sealed to prevent escape of insulation. Provide screens where openings must be maintained for drainage or ventilation. Remove any obstructions which might interfere with free flow of insulation to intended spaces during pouring.
 4. Pump foam into top of open cavities. Completely fill indicated cavities and spaces. Leave no gaps or voids.
 5. Place in lifts and rod to eliminate air pockets.
 6. Do not exceed pouring height distance greater than one story or 12 feet, whichever is less.
 7. Place prior to covering cores with bond beams or lintels.
- F. Acoustical Insulation:
1. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.
 2. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind outlets, around pipes, ducts, and services encased in wall or partition.
 3. Hold insulation in place with pressure sensitive tape or adhesive. Do not compress insulation below required thickness except where embedded items prevent required thickness.
 4. Where acoustical insulation is installed above suspended ceilings, install blanket at right angles to the main runners or framing. Extend insulation over wall insulation systems not extending to structure above.

END OF SECTION 07210

SECTION 07411 - METAL ROOFING AND WALL PANELING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Standing seam metal roof including panels with concealed fasteners and trim
 - 2. Flush seam metal soffits, including panels with concealed fasteners and trim
 - 3. Batten seam metal wall shingles, including panels with concealed fasteners
 - 4. Horizontal ribbed metal wall panels including panels with concealed fasteners and trim
 - 5. Prefinished metal parapet coping, fascia, edge trim,
 - 6. Prefinished Roof Drainage Systems: gutters, scupper, conductors and downspouts

- B. Related Work included in this section
 - 1. Roof Insulation
 - 2. Roof and wall panel underlayments

- C. Related Sections included in other sections:
 - 1. Division 5 Section "Structural Steel" for structural-steel framing.
 - 2. Division 5 Section "Steel Deck" for steel roof deck.
 - 3. Division 5 Section "Cold-Formed Metal Framing" for metal studs, bracing anchorage, and framing.
 - 4. Division 7 Section "Insulation" for rigid wall insulation
 - 5. Division 7 Section for Membrane Roofing
 - 6. Division 7 Section "Sheet Metal Flashing and Trim" for metal flashing and trim not part of this Work.
 - 7. Division 7 Section "Snow Retention System"
 - 8. Division 7 Section "Joint Sealants" for field-applied sealants.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. A653-00 Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip process.
 - 2. A792-99 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot Dip process.

- B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - 1. 1993 Edition Architectural Sheet Metal, 5th Edition

- C. National Roofing Contractor Association (NRCA)
 - 1. Roofing and Waterproofing Manual, 5th Edition

- D. Single Ply Roofing Institute (SPRI)
 - 1. 1994 Edition Wind Design for Use with Low Slope Roofing

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide manufactured roof and wall panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

- B. Air Infiltration: Provide manufactured roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. (.045 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air pressure difference of 4.0 lb./sq. ft. (192 Pa).
- C. Water Penetration: Provide manufactured roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 331 at a minimum of differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb./sq. ft. (300 Pa) and not more than 12.0 lf/sq. ft (575 Pa).
- D. Wind Uplift Resistance: Provide roof panel system assemblies including clips, meeting requirements of UL 580 for Class 90 wind-uplift resistance. The panel manufacturer must also subscribe to Underwriters Laboratories "Follow Up Service" assuring continuing compliance of the product with U.L. requirements.
- E. Structural Performance: Provide manufactured roof and wall panel assemblies capable of withstanding design wind loads indicated under in-service conditions with deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 1592 and ASTM E 330 by a qualified independent testing and inspecting agency.
 - 1. Maximum Deflection: 1/180 of the span.
- F. Coping System: Completed metal coping system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

1.4 SUBMITTALS:

- A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to material and finishes for each component and for total panel assemblies.
- B. Shop Drawings: Details of edge and corner conditions, joints, panel profiles, supports, anchorage, trim, flashings, underlayment, closures and special details. Distinguish between factory and field-assembled work.
- C. For installed products indicated to comply with certain design loadings, include structural analysis data signed by the qualified professional engineer responsible for their preparation.
- D. Samples for Initial selection: Manufacturer's color charts or chips showing the full range of colors available for roof and wall panels with factory-applied finishes.
- E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: Indicate compliance of manufactured roof and wall panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.
- G. Maintenance Manual at Project Closeout including Warranties

1.5 QUALITY ASSURANCE:

- A. Manufacturer Qualifications: Manufacturer shall have a minimum of ten years experience in manufacturing metal components for the roofing industry. Panels and accessories specified in this section shall be manufactured 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. If roll-forming on site is required to achieve panels that exceed 50' in length, then the operation

of the roll-forming equipment must be conducted by an employee of the manufacturer in order to maintain top quality control. Under no circumstances should this equipment be operated by the roofer, contractor, installer, erector, or anyone other than the manufacturer. No exceptions.

- B. Installer Qualifications: Engage an experienced installer (minimum of 5 years) who has completed metal roof, soffit and wall panel projects similar in material, design, and extent to that indicated for this Project and with a record of success in service performance. Installation contractor must be an approved and certified applicator by the specified metal roof manufacturer a minimum of 10 days prior to bid date. Contractor must supply A/E with a copy of this certification.
- C. Snow Retention System manufacturer shall obtain written verification from metal roofing manufacturer that snow retention system is compatible with roof system and will not alter conditions of warranty for roof system
- D. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated.
- E. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.
- F. Fire-Test-Response Characteristics: Where fire-resistance-rated roof panel assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 108 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: As indicated by design designations in UL's "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
- G. Coordination: Prior to ordering materials, a pre-roofing meeting will be held with the metal roof manufacturer, approved applicator, general contractor, owner, and the A/E to discuss the specified roofing system and its proper application.
 - 1. Coordinate application of the roofing system with other trades in such a manner that the complete installation is weather-tight and in accordance with all approved details and warranty requirements.
- H. Inspections: After the metal roof installation is complete, the manufacturer shall inspect the work and inform (by written report) the A/E, contractor, and the installer of defective/incomplete work to be remedied. Those areas indicated shall be corrected to the full satisfaction of the architect, owner, and manufacturer. The manufacturer shall submit written acceptance of the project to the architect prior to issuance of the weather-tightness warranty.
 - 1. Inspections shall be performed at each transition of roof detail encountered for each phase of roofing for the duration of the project. Each inspection must be conducted by an experienced, full-time employee of the manufacturer with experience in similar inspections over the past two years.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.
- B. Handling: Exercise care in unloading, storing, and erecting wall panels to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with a tarpaulin or other suitable weather-tight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other material that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the work, either establish opening dimensions and proceed with fabricating roof, soffit and wall panels without field measurements or allow for trimming panel units. Coordinate roof and wall construction to ensure actual locations of structural members and to ensure opening dimensions correspond to established dimensions.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract documents and shall be in addition to, and run concurrent with, other warranties made by the contractor under requirements of the Contract Documents.
- B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal panels within the specified warranty period and agreeing to repair or replace roof and wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to color fade, chalking, cracking, peeling, and loss of integrity.
- C. Finish Warranty Period: 20 years from date of Substantial Completion.
- D. Special Roof Weather-Tight Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace metal roof panel assemblies that fail to remain weather-tight within the specified warranty period. A weather-tight warranty is only available on systems installed by approved applicators, certified by the manufacturer.
- E. Roof Weather-Tight Warranty Period: 20 years from date of Substantial Completion.
- F. Roofing Installer Warranty: Installer shall provide a written warranty for five years from date of final completion and acceptance, guaranteeing materials, workmanship & weathertightness of the roof system, without any cost to the building owner or manufacturer.
- G. Coping, flashing and trim:
 - 1. The Contractor shall provide the owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of three years from the date of final acceptance of the building.
 - 2. Warranty shall include all materials and workmanship required to repair any leaks that develop.
 - 3. Installing contractor shall be responsible for the installation of the coping system in general accordance with the membrane manufacturer's recommendations.
 - 4. Installing Contractor shall certify that the coping system has been installed per the manufacturer's printed details and specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Roof panels, wall panels, soffits panels, roof trim, and parapet coping systems shall be fabricated by one manufacturer subject to compliance with requirements.

- B. Basis of Design: Sun Metal, 2139 Columbia Dr. SE., Albuquerque, New Mexico 87109, Phone: (505) 247-2278 / Fax: (505) 243-3780
- C. Products by other manufacturer's may be accepted as a substitute under the following conditions:
 - 1. Products must be equal or superior to specified product
 - 2. Products must be submitted and approved by the A/E in accordance with Section 01 60 00, Substitution Procedures

2.2 PANEL METALS AND FINISHES

- A. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755(ASTM A755M) and the following requirements.
 - 1. Steel Sheet: ASTM A 653, Steel sheet, G-90 Zinc-coated (galvanized) by the hot dip process; structural quality.
 - 2. Thickness: 24 Gauge thick, unless otherwise indicated.
 - 3. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.
 - a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight with a total minimum dry film thickness of 0.9 mil (0.023 mm) and 30 percent reflective gloss when tested according to ASTM D 523.
 - b. Color: Rio Grande Bronze SR.

2.3 PANEL ASSEMBLIES

- A. General: Fabricate panel face sheet to profile of configuration indicated; and of the material, finish and thickness indicated. Design joints between panels to form weather tight seals.
- B. Standing-Seam Roof Panels: Manufacturer's standard factory-formed, standing-seam roof panel assembly with factory-installed sealant in all standing seams. Designed for concealed mechanical attachment of panels through insulation to metal deck
 - 1. Basis of Design: SunSeam Roof Panel:
 - a. Mechanically seamed panel system.
 - b. 1 ½ inch (38.1 mm) high, 16 inch (406.4 mm) wide panel.
 - c. Panels will be supplied without striations.
 - 2. Clips: shall be a 3-part assembly consisting of
 - a. 2-piece floating clip minimum 24 gauge (0.024 inch), thick, galvanized steel
 - b. 3 inch by 5 inch 20 ga coated steel (yield strength to be 33,000 PSI) bearing plate as recommended by the roofing manufacturer for attachment over rigid insulation.
 - c. Panel clips must be designed to meet negative-load requirements.
 - d. Panel clips must be UL-90 rated.
- C. Soffit Panels: Manufacturer's standard factory-formed soffit panel assembly designed for concealed mechanical attachment of panels to purlin or secondary framing.
 - 1. Basis of Design: SunSoffit: Flush Seam panel system. 1 inch high, 15 inch, wide panel.
 - a. Panels will be supplied with 2 stiffening beads.
- D. Wall Shingle Panels
 - 1. Basis of Design: SunBatten Shingle Wall Panel: Pan and Batten panel system. 1 inch high, 15 ¾ inch wide panel by 60inch, with top and side seams
 - a. Panels will be supplied without striations.
 - 2. Clips: Provide clips as recommended by the wall panel manufacturer for installation over 2" thickness rigid wall insulation and wall substrate.

3. Panel Clips: Minimum 24 gauge (0.024 inch), (.65 mm) thick, galvanized steel as required.
 4. Installation: staggered
- E. Horizontal Ribbed Wall Panels: Manufacturer's standard factory-formed wall panel assembly designed for concealed mechanical attachment of panels to secondary framing.
1. Basis of Design: SunWall: Flush Seam panel system. 1 inch high, 15 inch, wide panel.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and accessories required for a complete roof, wall and soffit panel assembly as recommended by panel manufacturer, unless otherwise indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
1. Use galvanized steel fasteners for exterior and interior applications.
 2. Provide exposed fasteners with heads matching color of panel by means of factory applied coating.
 3. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels.
 4. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
- C. Accessories: Unless otherwise specified, provide components required for a complete panel assembly including trim, copings, fascia, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
1. Sealing Tape: Pressure-sensitive 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape.
 2. Joint Sealant: One-part elastomeric polyurethane or butyl sealant as recommended by panel manufacturer.
- D. Bituminous Coating: Cold-applied asphalt mastic, SSPC-paint 12, compounded for 15-mil (0.4 mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- E. Expansion Joint Sealant: For hook-type expansion joints that must be free to move, provide non-setting, non-hardening, non-migrating, heavy-bodied polyisobutylene sealant.
- F. Primer: Rust-inhibitive primer recommended by panel manufacturer for finish coat.

2.5 ROOF DRAINAGE SYSTEMS

- A. Downspouts: 24 Ga fluoropolymer coated galvanized steel
1. min 10 ft sections
- B. Conductors/Scuppers: 24 Ga fluoropolymer coated galvanized steel
- C. Commercial Grade Gutters: 24 Ga fluoropolymer coated galvanized steel
1. support straps and hangers at 30" oc
 2. concealed cover joints
- D. Gutter and Down Spout Anchorage Devices: Material as specified for system.

2.6 PARAPET COPING

- A. Sunlok Coping System: Metal coping cap with steel chair and concealed, hemmed splice plate at splices for capping parapet wall. The system shall be watertight and not require exposed fasteners.
1. Product Characteristics:
 - a. Coping system shall lock to anchor chair by Snap-On installation.
 - b. Coping shall expand and contract while mechanically locked in place.
 - c. Coping sections shall be 10'0" in length.
 - d. Coping front side and rear side shall be 4" nominal respectively.
 2. Splice Plate: 6 inches wide, concealed and hemmed to drain moisture.
 3. Butyl Tape and one part polyurethane sealant must be applied to splice plate per manufacturer's recommendation and details.
 4. Anchor Chair: 20 gauge galvanized steel, 12 inches wide at 5 foot 0 inches on center and mechanically fastened. Shim Plates must be installed on chair when splice plate is not required.
 5. Corners, endcaps, transitions, etc., shall be fabricated by the product manufacturer.
- B. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755 (ASTM A755M) and the following requirements.
1. Steel Sheet: ASTM A 653, Steel sheet, G-90 Zinc-coated (galvanized) by the hot dip process; structural quality.
 2. Thickness 22 gauge
 3. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.
 - a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight with a total minimum dry film thickness of 0.9 mil (0.023 mm) and 30 percent reflective gloss when tested according to ASTM D 523.
 - b. Color: Rio Grande Bronze SR

2.7 TRIM

- A. Fabricate trim/flashing and accessories to detailed profiles.
1. Fabricate trim/flashing from same material as panel.
- B. Prefabricated Roof Jacks
1. Pipe flashings shall be a one piece EPDM (ethylene propylene diene monomer) molded rubber boot having a serviceable temperature range of -65°F to 212°F (for standard applications) and shall be resistant to ozone and ultraviolet rays. Units shall have an aluminum flanged base ring. Do not install pipe flashings through any panel seams; install only in the flat portion of the panel.

2.8 THERMAL INSULATION

- A. Rigid boards of the following type:
1. Roof Insulation: Unfaced, preformed, rigid, cellular, polyisocyanurate thermal insulation, 4 inch (mm) thick, complying with ASTM C 591, Type 2, with aged thermal-resistance values for 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (1.1 K x sq. m/W at 24 deg C). Refer to Section 07210 for roof insulation values.
 2. Refer to Section 07210 for Wall Insulation and R-values
 3. Attachment: Mechanically fasten roof insulation.

2.9 PANEL UNDERLAYMENT

- A. Roof: Ice And Water Barrier recommended by the primary roofing manufacturer
 - 1. Manufacturer: Imetco's Drydek, basis of design
 - a. Self-adhering
 - b. Provides protection against freeze/thaw cycles, wind driven rain
 - c. 100% SBS modified
 - d. Polyester and fiberglass reinforced scrim engineered to tolerate extremely high temperatures (260 degrees F) and withstand thermal expansion and contraction of deck
 - e. Meet ASTM D 1970 Standards
- B. Walls: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts.

2.10 FABRICATION

- A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. If roll-forming on site is required to achieve full length panels, then the operation of the roll-forming equipment must be conducted by an employee of the manufacturer in order to maintain top quality control. Under no circumstances should this equipment be operated by the roofer, contractor, installer, erector, or anyone other than the manufacturer. No exceptions. Comply with indicated profiles and with dimensional and structural requirements.
- B. Panels
 - 1. Roll-formed in one continuous length.
 - 2. Fabricate roof panel joints with hot melt mastic to provide a tight seal.
- C. Trim must be fabricated by manufacturer.

2.11 DECKING, PANEL SUPPORTS AND SECONDARY FRAMING

- A. Panel Supports and Anchorage: Under work of Division 5, provide decking, furring channels, angles, plates, bracing, and other secondary framing members, complying with the Light Gauge Structural Institute's "Guide Specifications" section 07410, "Manufactured Roof and Wall Panels."
 - 1. Eave Struts: Unequal flange C-shaped sections formed to provide adequate back-up for roof panels. Fabricate from shop-painted, roll-formed steel (gauge as determined by others). Brake formed eave struts will not be allowed.
 - 2. Flange and Sag Bracing: 1 5/8-by-1 5/8 inch (41-by-41 mm) angles, fabricated from shop-painted, roll-formed steel (gauge as determined by others). Brake forming will not be allowed.
 - 3. Base or Sill Angles: Fabricate from cold-formed galvanized steel sections (gauge as determined by others).
 - 4. Secondary structural members
 - 5. Soffit framing

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panels.
 - 1. Panel Supports and Anchorage: Examine substrate to verify that decking, angles and other secondary structural panel support members and anchorage have been installed to meet requirements of panel manufacturer.

2. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate metal roof and wall panels with all other work: including flashing, trim and construction of decks, parapets, wall, and other adjoining work to provide a leak proof, secure and non-corrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.3 INSULATION INSTALLATION

- A. Install only as much insulation as can be covered with roofing membrane and completed before the end of the day's work or before the onset of inclement weather.
- B. Install polyisocyanurate insulation board in 2" layers mechanically attached. Install polyisocyanurate insulation in solvent free insulation adhesive.
- C. Fasten insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
- D. Refer to Section 07210 for wall insulation installation.

3.4 PANEL INSTALLATION

- A. General: comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Field cutting exterior panels by torch is not permitted.
 2. Install panels with concealed fasteners. Panel clips to be spaced as required by the manufacturer.
 3. Over insulation, install 1 ply of roofing underlayment as recommended by the manufacturer.
 4. Roof panels must be face-fastened to the substrate at the top to control thermal expansion and contraction in one direction. Do not face-fasten at both ends.
 5. Roof panels must have first and last fastening clips located at least 3 inches (72.2 mm) away from panel ends.
 6. When panels must be lapped, install panels in vertical sets (from eave to ridge), so that panels can be adjusted to align seams.
 7. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled, uniform compression for positive seal without rupture of neoprene washer.
- B. Install underlayment under metal panels, unless otherwise recommended by panel manufacturer. Use adhesive for temporary anchorage, where possible to minimize the use of mechanical fasteners under metal panels. Apply from eave to ridge in shingle fashion and lap joints a minimum of 2 inches (50 mm).
- C. Accessories: Install components required for a complete panel assembly including trim, copings, fascia, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, mullions, sills, corner strips, and similar items.
- D. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

- E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.
1. Install weather-seal under ridge cap and where required to prevent air and moisture penetration. Flash and seal panels at ends and intersections with other materials with closures to exclude weather.
 2. Seal panel end laps with a bead of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
 3. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
- F. Standing Seam Roof Panel Assembly: Fasten panels to supports with concealed clips according to panel manufacturer's written instructions.
1. Install clips at spacing required by roof manufacturer with self-drilling/self-tapping fasteners.
 2. At end laps, install tape sealant between panels.
 3. Complete seaming of panel joints by operating portable power-driven equipment of type recommended by panel manufacturer to provide a weather-tight joint.
- G. Soffit Panel /Wall Shingle Panel Assembly: Fasten panels to supports with concealed fasteners according to panel manufacturer's written instructions.
1. Align panels. Fasten panels, flashing and trim with blind rivets or self-tapping screws.
 2. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating or by other permanent separation as recommended by manufacturers of dissimilar metals.
- H. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on level, plumb and location lines as indicated and within 1/8 inch (3 mm) offset of adjoining faces and of alignment of matching profiles.

3.5 COPING AND ACCESSORY PREPERATION

- A. Coping shall be secured to wood nailers with an anchor chair 12 inches wide, 5 foot 0 inches on center. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, Factory Mutual I-60 wind uplift specifications and/or manufacturer's recommendations, whichever is the highest standard. Installer shall furnish mechanical fasteners suitable for parapet substrates.
- B. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied. Manufacturer shall provide all factory-fabricated accessories including, but not limited to, coping transitions, miters, scuppers, joint covers, etc.

3.6 COPING INSTALLATION

- A. Installing Contractor shall be responsible for determining if the coping system is in general conformance with metal and roof manufacturer's recommendations.
- B. Allow sufficient clearances for expansion and contraction of linear metal components. Secure metal using fasteners as required by the system. No exposed face fastening shall be accepted.
- C. Install manufactured fascia and coping cap systems in strict accordance with manufacturer's printed instructions.
- D. Installer must use a high-grade sealant under splices to make installation watertight. Install anchor chair every 5 foot 0 inches on center.

- E. Install miters first.
1. Position base flashing of roofing membrane over the wall edge covering nailers completely, fastening eight (8) inches on center. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations.
 2. Install minimum twelve (12) inch wide anchor chair at 5 foot 0 inches on center.
 3. Install 6 inch wide splice plate by centering over 12 inch wide anchor chair.
 4. Apply two beads of sealant approximately 2 inches in from the coping cap joint and one strip of butyl tape at each side of hem. Shim plate is installed on chair when splice plate is not required.
 5. Install Coping Cap by hooking outside hem of coping on outside face of anchor chair. Press downward on inside edge of coping until "snap" occurs and hem is engaged on the entire chair.
 6. Crimp coping hem at rear chair.
 7. Remove protective plastic film immediately after installation and touch up scraped or damaged paint with factory supplied paint in matching color.

3.7 CLEANING AND PROTECTING

- A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

3.8 MAINTENANCE BY INSTALLER BEFORE LEAVING JOBSITE:

- A. Remove metal filings from panels and flashings at the end of each day. Filings from drilling, grinding and cutting can start to rust overnight. At end of project, make final check for any filings. If rust spots have already appeared they can be removed with a non-abrasive cleaner. Do not use abrasive cleaners.
- B. Touch-up paint should be used on scratches, but should be used sparingly and applied with a small artist's brush. If scratches penetrate the zinc coating on galvanized material, a zinc rich primer should be applied in the scratch before the touch-up paint is applied.
- C. Clean or power wash panels as necessary after completion of project. This includes removing excess unsightly caulking. Caulking can be removed with mineral spirits. Rinse residue with clean water.
- D. Remove debris and crating material from the site.

3.9 MAINTENANCE AND MAINTENACE MANUAL

- A. Provide binder for owner including routine maintenance for metal panels. Include instructions to
1. File job records, including project plans, specifications, shop drawings, warranties (if any), etc., pertaining to roofing and wall paneling for future reference.
 2. Set up maintenance inspection schedule.
 3. Use caution: steep metal roofs can be slippery. A qualified metal roofing contractor may be required for roof inspections.
 4. Keep gutters and downspouts clear of debris that can impede water flow.
 5. Immediately remove any vegetation or debris that contacts metal panels. This includes tree branches, leaves, weeds, grass, etc.
 6. Eliminate any conditions that are causing water to pond and accumulate on panels.
 7. Reseal curbs, gutters, flashings, closures, penetrations, etc. as necessary to maintain the weathertightness of the system. Typically, a one part polyurethane sealant (such as Sikaflex 201) is best for such repairs. The owner may wish to hire a qualified, experienced metal contractor for these repairs.

8. Panel cleaning instructions
9. Repair instruction for damage that may have occurred to panels with caulking, touch-up paint, etc.

END OF SECTION 07411

SECTION 07540 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes adhered membrane roofing systems.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include plans, sheet layout, seam locations, penetrations, special conditions, elevations, sections, details, non-standard details and attachments to other Work.
- C. Samples: For each product included in membrane roofing system, 12" square.
- D. Research/evaluation reports.
- E. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products, and who has not less than 3 years successful experience in the installation of flexible membrane roofing systems..
- B. Source Limitations: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.
- C. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
- D. Preinstallation Conference: Conduct conference at Project site with manufacturer's representative.
- E. Conform to building code requirements for "high wind" area, Exposure C. Provide ICC approved documentation and if necessary, design calculations for building and site conditions.
- F. FM rating: Provide materials and systems which have been tested and approved by factory mutual for I-90 rating.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form, without monetary limitation ("no dollar amount") in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within 15 years from date of Substantial Completion. Failure includes roof leaks.

- B. Warranty Requirements: Roofing manufacturer to inspect roofing installation at stages required to ensure performance of warranty specified above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:
1. Manufacturers:
 - a. GAF Materials Corp.; EverGuard & Freedom TPO (Basis-of-Design)
 - b. Carlisle SynTec Incorporated.
 - c. Firestone Building Products Company.
 - d. GenFlex Roofing Systems (Basis-of-Design).
 - e. Johns Manville International, Inc.
 - f. MuleHide
 - g. Sarnafil Inc.
 - h. Stevens Roofing Systems; Div. of JPS Elastomerics
 - i. Versico Inc.
 2. Thickness: 60 mils
 3. Exposed Face Color: White.
 4. Physical Properties:
 - a. Breaking Strength: 350 lbf; ASTM D 751, grab method.
 - b. Elongation at Break: 30 percent; ASTM D 751.
 - c. Tearing Strength: 86 lbf (245 N) minimum; ASTM D 5884, Procedure B.
 - d. Brittleness Point: Minus 60 deg F, ASTM D2139
 - e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- (75-mm-) diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F (40 deg C) and an ozone level of 100 pphm (100 mPa); ASTM D 1449.
 - f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F (116 deg C); ASTM D 573.
 - g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F (70 deg C); ASTM D 471.
 - h. Linear Dimension Change: Plus or minus 2 percent; ASTM D 1204.

2.3 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.

- C. Bonding Adhesive: Manufacturer's standard [solvent] [water]-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
- D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- E. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25 mm) wide by 0.05 inch (1.3 mm) thick, prepunched.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, slip sheet, and other accessories.

2.4 SUBSTRATE BOARDS

- A. A.Glass-Mat Gypsum Board: Gypsum board designed as an exterior substrate for a weather barrier, consisting of a noncombustible water-resistant core, essentially gypsum, surfaced with glass mats on face and back, partially or completely embedded in core, and with unsurfaced square edges. Comply with ASTM C 1177 and requirements indicated below:
- B. B. Products: Subject to compliance with requirements, provide the following:
 - 1. Glass-Mat Gypsum Roof Sheathing Board: "Dens-Dek" by Georgia-Pacific Corporation (Basis-of-Design).
- C. C. Sheathing Fasteners: ASTM C 954, steel drill screws, Type S-12 fluted tip, a minimum of 1-1/4 inches (32 mm) long, with organic-polymer coating or other corrosion-protective coating.

2.5 ROOF INSULATION

- A. Provide Extruded-Polystyrene Board Insulation: ASTM C 578, Type X, 1.3-lb/cu. ft. (21-kg/cu. m) minimum density, square edged.
 - 1. Polyisocyanurate insulation may be substituted
- B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- B. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

- C. Roofing Asphalt: ASTM D 312, Type III or IV.
 - 1. Asphalt Primer: ASTM D 41.

2.7 WALKWAYS

- A. Flexible Walkways: Extra thickness of roof membrane specified above, adhered to surface in locations required for access to equipment of roof, or as indicated on Drawings.

PART 3 - EXECUTION

3.1 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

3.2 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 1-1/2 inches (38 mm) or greater, install 2 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.
- E. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - 1. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.
 - 2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
- F. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck.
 - 1. Fasten to resist uplift pressure at corners, perimeter, and field of roof.

3.3 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
 - 1. Install sheet according to ASTM D 5036.
- B. Bonding Adhesive: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

- C. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- D. Provide water cut-offs at end of each day's work to prevent penetration of water or moisture into insulation or substrate

3.4 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with sheet flashing.
- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars

3.5 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency 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 on completion and submit report to Architect.
- C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

END OF SECTION 07540

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Flashings, sheet metal work and related items including, but not limited to:
 - 1. Metal counterflashing at vertical surfaces.
 - 2. Flashing at roof penetrations.
 - 3. Edge flashing, not including prefinished flashing exposed to view.
 - 4. Miscellaneous sheet metal accessories.

1.2 RELATED SECTIONS

- A. Division 7 – “Metal Roofing and Wall Paneling” for prefinished metal
 - 1. Roof drainage systems: conductors, scuppers, gutters and downspouts
 - 2. Exposed metal trim/fascia units.
 - 3. Parapet copings.
- B. Extent of each type of flashing and sheet metal work is indicated on Drawings and by provisions of this section.
- C. Finished sheet metalwork will form a weathertight construction without waves, warps, buckles, fastening stresses or distortion, which allows for expansion and contraction. Sheet metal mechanic shall be responsible for cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous roofing operations.
- D. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- E. Roofing accessories which are installed integral with roofing membrane are specified in roofing system sections as roofing work.

1.3 SUBMITTALS

- A. Product Data, Flashing, Sheet Metal, Accessories: Submit manufacturer’s product data, installation instructions, and general recommendations for each specified sheet material and fabricated product.
- B. Shop Drawings, Flashing, Sheet Metal, Accessories: Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter flashings, and trim/fascia units; layouts at 1/4” scale, details at 3” scale.

1.4 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with design and installation methods of SMACNA Architectural Sheet Metal Manual.
 - 2. Comply with The NRCA Roofing and Waterproofing Manual installation details.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.6 JOB CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS

- A. Sheet Metal Flashing/Trim:
 - 1. Zinc-Coated Steel: Commercial quality with 0.20% copper, ASTM A 525 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359" thick (24 gage) except as otherwise indicated.
- B. Reglets and Counterflashings: Fry Reglet Corporation, Type ST at stucco, Type MA at masonry, Type CO (galvanized steel) at concrete, or fabricated as indicated on Drawings.

2.2 ACCESSORIES

- A. Solder: For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.
- B. Fasteners: Same metal as flashing/sheet metal or, other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
- C. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- E. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed; comply with FS TT-S-0027, TT-S-00230, or TT-S-001543.
- F. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.
- G. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
- H. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

- I. Gutter and Conductor-Head Guards: 24 gage bronze or nonmagnetic stainless steel mesh or fabricated units, with selvaged edges and noncorrosive fasteners. Select materials for compatibility with gutter and downspouts.
- J. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.
- K. Roofing Cement: ASTM D 2822, asphaltic.

2.3 FABRICATION

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansive type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers, for installation behind main members where possible. Fabricate mitered and welded corner units.
- G. Prefabricated counterflashing and reglet system: Form upper edge of counterflashing with an approved snap lock flange to engage reglet receiver and to provide a spring action at bottom edge against built-up flashing.

2.4 FINISH

- A. Shop prepare and prime exposed ferrous metal surfaces.
- B. Backpaint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 1.5 mil.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams which will be permanently watertight and weatherproof.
- B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof polyethylene underlayment.
- D. Metal Edgings:
 - 1. Provide metal drip edgings designed to allow water run-off to drip free of underlying construction at exposed edges of roofs indicated
 - 2. Fabricate from 24 gage galvanized iron, profile indicated.
 - 3. Extend flanges of metal edgings out on top of roofing or base flashing (as applicable) not less than 4 inches. Set in full bed of plastic cement. Spread full bed of plastic cement between sheets at laps. Nail flanges to wood nailer when nailers are under the membrane or flashing (as at roof edge or gravel stops). Nail as shown in the referenced quality standards.
- E. Sheet Metal Covering on Flat, Sloped, or Curved Surfaces:
 - 1. Except as specified or indicated otherwise, cover and flash all minor flat, sloped, or curved surfaces such as crickets, bulkheads, dormers and small decks with metal sheets of the material used for flashing; maximum size of sheets, 16 by 18 inch.
 - 2. Fasten sheets to sheathing with metal cleats.
 - 3. Lock seams and solder. Lock aluminum seams as recommended by aluminum manufacturer.
 - 4. Provide an underlayment of roofing felt for all sheet metal covering.
- F. Flashing at Roof Penetrations and Equipment Supports:
 - 1. Provide metal flashing for all pipes, ducts, and conduits projecting through the roof surface and for equipment supports, guy wire anchors, and similar items supported by or attached to the roof deck.
- G. Install reglets to receive counter-flashing in manner and by methods indicated.
 - 1. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections.
 - 2. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.
- H. Counterflashing:
 - 1. Provide metal counterflashing at top edges of base flashings and at other locations indicated.
 - 2. Lap end joints a minimum of 3 inches. Do not solder or weld joints. Make flashing continuous at angles. Counterflashing shall overlap base flashing a minimum of 4 inches, unless otherwise indicated.
 - 3. Where counterflashing terminates in reglets, fasten flashing with lead wedges every 12 inches. Fill reglets continuously with synthetic rubber type sealant.
- I. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6". Fabricate seams at joints between units with minimum 3" overlap, to form a continuous waterproof system.
- J. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters.

3.2 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substrates which might cause corrosion of metal or deterioration of finishes.
- B. Protection: protect flashings and sheet metal work during construction from damage or deterioration, other than natural weathering, at time of substantial completion.

END OF SECTION 07620

SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Roof curbs.
 - 2. Equipment supports.
 - 3. Roof hatches.

1.2 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated.
- B. Shop Drawings: Show fabrication and installation details for roof accessories.

1.3 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

- A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated and mill phosphatized for field painting.
- B. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated.

2.3 ROOF CURBS AND EQUIPMENT SUPPORTS

- A. Roof Curbs and Equipment Supports: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1. Manufacturers:
 - a. Colony Custom Curbs.
 - b. Conn-Fab Sales, Inc.
 - c. Metallic Products Corporation.
 - d. Pate Company (The).
 - e. Roof Products & Systems Corporation.
 - f. Roof Products, Inc.
 - g. Thaler Metal Industries Ltd.
 - h. ThyCurb; Div. of Thybar Corporation.
 - i. Uni-Curb, Inc.
2. Load Requirements: per MEP requirements; see Drawings.
3. Material: Galvanized steel sheet, 0.052 inch (1.32 mm) minimum thick.
4. Liner: Same material as curb, of manufacturer's standard thickness and finish.
5. Factory install wood nailers at tops of curbs.
6. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
7. Factory insulate curbs with 1-1/2-inch- (38-mm-) thick, glass-fiber board insulation.
8. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches (300 mm), unless otherwise indicated.
9. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.4 ROOF HATCHES

- A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated single-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.
1. Basis of Design Manufacturer: The Bilco Company (The).
 2. Other manufacturers:
 - a. Custom Curb, Inc.
 - b. J. L. Industries, Inc.
 - c. Metallic Products Corporation.
 - d. Milcor Inc.; a Gibraltar Company.
 - e. Nystrom, Inc.
 - f. O'Keeffe's Inc.
 - g. Roof Products & Systems Corporation.
 - h. ThyCurb; Div of Thybar Corporation.
 3. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. (1.9-kPa) external and 20-lbf/sq. ft. (0.95-kPa) internal loads.
 4. Type and Size: Single-leaf lid, 30 x 36 inches, or as required by local jurisdictions.
 5. Curb and Lid Material: Galvanized steel sheet, 0.079 inch (2.0 mm) thick.
 - a. Finish: Prime painted, Baked enamel or Powder coat.
 6. Insulation: Glass-fiber or Polyisocyanurate board.
 7. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
 8. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
 9. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
 10. Fabricate units to minimum height of 12 inches (300 mm), unless otherwise indicated.
 11. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
 12. Ladder Safety Post (if required): Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.

13. Safety Railing System (if required): Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for a complete installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 1. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
 2. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

END OF SECTION 07720

SECTION 07722 – SNOW RETENTION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Deck-mount snow fences for standing seam metal roofing systems.

1.2 RELATED SECTIONS

- A. Section 07411 - Metal Roof Panels.
- B. Section 07620 - Sheet Metal Flashing and Trim.

1.3 REFERENCES

- A. NRCA Roofing and Waterproofing Manual.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Provide written statement from manufacturer that installation of proposed snow retention system will not void roofing manufacturer's warranty.**
- C. Manufacturer's data sheets on each product to be installed, including model number, material, color, finish and installation instructions.
- D. Verification Samples: Two representative samples of each type of product to be installed.
- E. Shop Drawings: Manufacturer's engineered layout chart based on roof material, code ground snow load, roof slope and sheathing thickness.
- F. Manufacturer's Certification: Manufacturer's standard warranty stating in writing that systems and layout have been engineered for project conditions and location and are suitable for use.

1.5 QUALITY ASSURANCE

- A. Convene a pre-installation conference prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of layout and installation details.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. Provide Installer's two-year warranty on workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: TRA-MAGE Roof Accessory Systems, which is located at: 1657 S. 580 East P. O. Box 682 ; American Fork, UT 84003; Toll Free Tel: 800-606-8980; Tel: 801-756-8666; Fax: 801-756-7891; Email: info@tra-mage.com; Web: www.tra-mage.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 SNOW FENCES

- A. Mounting:
 - 1. Standing Seam Metal Mount, Two Pipes; Model: C-2-2.
- B. Components:
 - 1. Pipe: 1-inch (25 mm) diameter, 10-foot (3050 mm) sections, each section includes one union.
 - 2. Mounting Bracket: 1/4 inch (6 mm) plate.
 - 3. Material: Zinc plated steel
- C. Base Size:
 - 1. Base Size: Standard.
- D. Finish:
 - 1. Finish: Hot-Dip Galvanized.
 - 2. Color: Selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until roofing work is complete in the area in which products will be installed.
- B. If roof-covering materials are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 SNOW RETENTION SYSTEM INSTALLATION

- A. Snow Fences: Install one row of snow fences at the eave over the plate line. Secure to the rafters. Space supports every 2 feet (610 mm) or per manufacturer's recommendations. Add additional rows according to manufacturer's recommendations.
 - 1. Brackets for rafter-mounted snow fence shall be installed prior to roof sheathing.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.02 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

- a. Penetrations located outside wall cavities.
- b. Penetrations located outside fire-resistance-rated shaft enclosures.

- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

- E. Where there is no specific third party tested and classified firestop system available for a particular firestop configuration, the firestopping contractor shall obtain from the firestop manufacturer an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFFRA) for submittal.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
 - 2. Submit completed firestop schedule on form at end of this Section.
- C. Qualification Data: For Installer.

1.04 QUALITY ASSURANCE

- A. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- B. Tested and listed firestop systems are to be used before an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) is installed.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, OPL, ITS, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 that are produced by one of the following manufacturers:
 - 1. Hilti, Inc.
 - 2. Nelson Firestop Products.
 - 3. Specified Technologies Inc.
 - 4. 3M; Fire Protection Products Division.

2.02 FIRESTOPPING

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop

systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

PART 3 - EXECUTION

3.01 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. Include the following information on labels:
 - 1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Through-penetration firestop system manufacturer's name.
 - 6. Installer's name.

3.02 FIELD QUALITY CONTROL

- A. Inspecting Agency: Engage an independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.03 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Concrete Floors:

CONCRETE FLOORS		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRATION	F-RATING (HR)	HILTI	3M	STI	NELSON
CIRCULAR BLANK OPENINGS	1	FA 0006 CAJ 0070	CAJ 0009	CAJ 0006	CAJ 0043
CONCRETE FLOORS		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRATION	F-RATING (HR)	HILTI	3M	STI	NELSON
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226 CAJ 1184	CAJ 1058	CAJ 1079	CAJ 1191
SINGLE NON-METALLIC PIPE OR CONDUIT (i.e. PVC, CPVC, ABS, ENT)	1	FA 2053 CAJ 2109 CAJ 2098 CAJ 2141 CAJ 2167 CBJ 2021	CAJ 2189 CAJ 2117 CAJ 2027	CAJ 2089 CAJ 2031	CAJ 2096
SINGLE OR BUNDLED CABLES	1	FA 3007 CAJ 3095 CAJ 3096	CAJ 3021	CAJ 3154	CAJ 3117
CABLE TRAY	1	CAJ 4034 CAJ 4035	CAJ 4003	CAJ 4029	CAJ 4001
SINGLE INSULATED PIPES	1	FA 5015 FA 5016 CAJ 5090 CAJ 5091 CAJ 5098	CAJ 5080 CAJ 5024 CAJ 5017	CAJ 5103 CAJ 5079 CAJ 5087	CAJ 5203CAJ 5104
ELECTRICAL BUSWAY	1	CAJ 6006 CAJ 6017	CAJ 6001 CAJ 6002	N/A*	CAJ 6004
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046 CAJ 7051	CAJ 7003 CAJ 7021	CAJ 7027 CAJ 7023	CAJ 7079 CAJ 7078
MIXED PENETRANTS	1	CAJ 8041 CAJ 8056	CAJ 8001 CAJ 8013	CAJ 8053 CAJ 1208	CAJ 8118

1. N/A* indicates that no UL-Classified system is available for manufacturer indicated. Manufacturer may provide engineering judgment drawing acceptable to Authorities having jurisdiction.
2. Project site conditions of each through-penetration firestop system shall meet details of the UL-Classified System selected by Contractor.

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3. If project site conditions do not match any UL-classified systems scheduled below, then contact firestop manufacturer for alternative systems or engineering judgment drawings.
4. Where more than one applicable UL-Classified System is listed in the schedules, choose the UL System which is most economical for each through-penetration firestop system.
5. Coordinate work with other trades to assure that penetration opening sizes are appropriate for penetrant locations, and vice versa.

C. Concrete or CMU Walls:

CONCRETE OR CMU WALLS		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRATION	F-RATING (HR)	HILTI	3M	STI	NELSON
CIRCULAR BLANK OPENINGS	1	CAJ 0055, CAJ 0070	CAJ 0009	CAJ 0006	CAJ 0043
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, WJ 1021	CAJ 1058	CAJ 1079, WJ 1070	CAJ 1191
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, ENT)	1	CAJ 2109, CAJ 2098	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2089, CAJ 2031	CAJ 2096
SINGLE OR BUNDLED CABLES	1	WJ 3036, CAJ 3095, CAJ 3096	CAJ 3021	CAJ 3154	CAJ 3117
CABLE TRAY	1	WJ 4016, CAJ 4034, CAJ 4035	CAJ 4003	CAJ 4029, WJ 4022	CAJ 4001
SINGLE INSULATED PIPES	1	CAJ 5090, CAJ 5091, CAJ 5061	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5103, CAJ 5079, CAJ 5087	CAJ 5203 CAJ 5104
ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	N/A*	CAJ 6004
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, CAJ 7051, WJ 7021, WJ 7022	CAJ 7003, CAJ 7021	CAJ 7027, CAJ 7023, WJ 7007	CAJ 7079 CAJ 7078
MIXED PENETRANTS	1	CAJ 8041, CAJ 8056 WJ 8007	CAJ 8001, CAJ 8013	CAJ 8053, CAJ 1208	CAJ 8118

1. N/A* indicates that no UL-Classified system is available for manufacturer indicated. Manufacturer may provide engineering judgment drawing acceptable to Authorities having jurisdiction.
2. Project site conditions of each through-penetration firestop system shall meet details of the UL-Classified System selected by Contractor.
3. If project site conditions do not match UL-classified systems scheduled below then contact firestop manufacturer for alternative systems or engineering judgment drawings.
4. Where more than one applicable UL-Classified System is listed in the schedules, choose the UL System which is most economical for each through-penetration firestop system.
5. Coordinate work with other trades to assure that penetration opening sizes are appropriate for penetrant locations, and vice versa.

END OF SECTION

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints in dimension stone cladding.
 - d. Joints between metal panels.
 - e. Perimeter joints between materials listed above and frames of doors and windows.
 - f. Control and expansion joints in ceiling and overhead surfaces.
 - g. Other joints as indicated.
2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - e. Other joints as indicated.

1.02 PERFORMANCE REQUIREMENTS

- A. Provide exterior elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.03 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Selection: Manufacturer's color charts consisting of strips of cured sealants showing the standard range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required. Install 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. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience.
- E. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Application shall be done by a Joint Sealant Subcontractor with five years experience. Submit documentation to the Architect and Owner
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Manufacturer Technical Assistance: Materials shall be supplied by manufacturer who will provide qualified technical assistance at the Project site.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
 - 3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- E. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: 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.
 - 2. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.07 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. ACCEPTABLE MANUFACTURERS:
 - 1. Mameco International, Inc., Cleveland, OH
 - 2. Pecora Corporation, Harleysville, PA
 - 3. Sika Corporation, Lyndhurst, NJ
 - 4. Sonneborn Building Products, Minneapolis, MN
 - 5. Tremco, Cleveland, OH
- B. PRODUCT OPTIONS AND SUBSTITUTIONS: Refer to Section 01600.

2.02 MATERIALS:

- A. TYPE 1 SEALANT: (For joints in horizontal planes) Two-component, self-leveling urethane or polyurethane sealant complying with FS TT-S-00227E, Type 1, Class A, and ASTM C920, Type M, Grade P, Class 25, custom color as selected by the Architect. Acceptable products include:
 - 1. Mameco "Vulkem 245"
 - 2. Pecora "Urexpan 200"
 - 3. Sika Corporation "Sikaflex-2c SL"
 - 4. Sonneborn "Paving Joint Sealant"
 - 5. Tremco "THC 900/901"
- B. TYPE 2 SEALANT: (For joints in vertical planes) Two-component, non-sagging urethane or polyurethane sealant with a movement capability of 50% of the joint width in extension and 25% of the joint width in compression, complying with FS TT-S-00227E, Type II, Class A, and ASTM C920, Type M, Grade NS, Class 25, custom color as selected by the Architect. Acceptable products include:
 - 1. Mameco "Vulkem 227"
 - 2. Pecora "Dynatrol II"
 - 3. Sika Corporation "Sikaflex-2c NS"
 - 4. Sonneborn "NP-2"
 - 5. Tremco "Dymeric 511"

- C. TYPE 3 SEALANT: (For interior door frames and other static joints) General purpose, gun grade, paintable, acrylic latex caulk complying with ASTM C834. Acceptable products include:
1. Pecora "AC-20"
 2. Sonneborn "Sonolac"
 3. Tremco Acrylic Latex 834
- D. TYPE 4 SEALANT: (For tooled or saw-cut control joints in interior slabs) Two-part, pour grade, 100% solids, flexible epoxy joint compound, with minimum Shore D hardness 55 ± 10 per ASTM D2240, elongation 15% per ASTM D638, tensile strength 400 psi (7 days) per ASTM D638, and compressive strength 3000 psi (3 days) per ASTM C109. Acceptable products include:
1. Mameco "Vulkem 275"
 2. Sika Corporation "Sikadur 51 SL"
- E. TYPE 5 SEALANT: (For joints in restrooms, janitor's closets, and other areas subject to continued moisture exposure or high humidity) One-part, non-sag, mildew resistant silicone sealant, Shore A hardness 25-30, joint movement $\pm 25\%$, color as selected by the Architect. Acceptable products include:
1. Dow Corning "786"
 2. GE "Sanitary 1700"
 3. Sonneborn "OmniPlus"
- F. TYPE 6 SEALANT: (For fire-rated joints) One component, low-modulus silicone sealant complying with FS TT-S-01543A and FS TT-S-00230C, joint movement capabilities + 100% extension and -50% compression, tested for minimum 2 hour fire endurance in accordance with UL 263 (ASTM E119), color as selected by the Architect. *NOTE: This material is not intended for use as a through-stop fire-penetration sealant.* Acceptable products include:
1. Dow Corning "790"
 2. Approved substitute
- G. BACKER ROD – JOINTS IN HORIZONTAL PLANES: Resilient, closed cell, polyethylene foam rod designed for use with cold-applied sealants, diameter 25-50% larger than joint width, as recommended by sealant manufacturer.
- H. BACKER ROD – JOINTS IN VERTICAL PLANES: Flexible, compressible, non-gassing, open cell urethane foam rod designed for use with cold-applied sealants, diameter approximately 25-50% larger than joint width, as recommended by sealant manufacturer.
- I. BACKER ROD – SILICONE SEALANTS (VERTICAL AND HORIZONTAL PLANES): Resilient, closed cell, polyethylene foam rod designed for use with cold-applied sealants, diameter 25-50% larger than joint width, as recommended by sealant manufacturer
- J. BOND-BREAKER TAPE: Pressure-sensitive polyethylene tape.
- K. PRIMER: As recommended by sealant manufacturer for particular substrate.

2.01 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant.
- B. Additional Movement Capability: Where additional movement capability is required provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920.

- C. Stain-Test-Response Characteristics: Nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Interior Silicone Rubber Sealant:
 - 1. Silicone rubber-base, one-part elastomeric sealant, complying ASTM C920, Type S, Class 25, Grade NS.
 - 2. Use acid-type for non-porous joint surfaces, and non-acid type where one or both joint surfaces are porous.
 - 3. For wet areas use type compounded specifically for mildew resistance.
 - 4. Use for interior joints between equipment or countertops and walls.
- E. Exterior Sealant:
 - 1. Two-Component Polyurethane: Polyurethane-based, 2-part elastomeric sealant, complying with ASTM C920 Type M, Class 25, Grade NS (non-sag), Tremco "Dymeric", Pecora "Dynatrol II."
 - 2. One-Component Silicone:
 - a. Precast Concrete Surfaces: #790 by Dow-Corning
 - b. Stone and Glass Surfaces: #795 by Dow-Corning
 - 3. For exterior and interior sidewalk and floor joints, polyurethane as above except Grade P (self-leveling), Tremco "Dymeric", Pecora "Urexpan NR-200."

2.02 LATEX JOINT SEALANTS

- A. Latex Sealant Standard: Comply with ASTM C 834 for each product.
- B. One-component Acrylic Sealant: Acrylic emulsion sealant, one-part, mildew resistant and paintable, complying with ASTM C834, recommended by manufacturer for general use as an exposed building construction sealant, Pecora AC-20.

2.03 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Provide manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
 - 1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
- C. Available Products: Subject to compliance with requirements, acoustical sealants that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a) PL Acoustical Sealant; ChemRex, Inc.; Contech Brands.
 - b) AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
 - c) SHEETROCK Acoustical Sealant; United States Gypsum Co.
 - 2. Acoustical Sealant for Concealed Joints:

- a) BA-98; Pecora Corp.
- b) Tremco Acoustical Sealant; Tremco, Inc.

2.04 PREFORMED JOINT SEALANTS

- A. Preformed Silicone-Sealant System: Provide manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
- B. Preformed Foam Sealants: Provide manufacturer's standard preformed, precompressed, impregnated, open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; factory produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following:
 - 1. Properties: Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
 - 2. Impregnating Agent: Manufacturer's standard.
 - 3. Density: Manufacturer's standard.
 - 4. Backing: Pressure-sensitive adhesive, factory applied to one side with protective wrapping.

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 type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
 - 2. Type B: Bicellular material with a surface skin.
 - 3. Type: Any material indicated above.
- 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.
- 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.
- 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.

PART 3 - EXECUTION

3.1 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.

3.2 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, blast cleaning, 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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer. 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 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.

3.3 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 of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
- F. Install sealants by proven techniques to 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 provided for each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealants from surfaces adjacent to joint.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Use masking tape to protect adjacent surfaces of recessed tooled joints.
- H. 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 a bead of silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's printed schedule and covering a bonded area of not less than a 3/8 inch (10 mm). Hold edge of sealant bead inside of masking tape by 1/4 inch (6 mm).
 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 horizontal joints before installing vertical joints. Lap vertical joints over horizontal joints. At end of joints, cut silicone extrusion with a razor knife.
- I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, to produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant to comply with sealant manufacturer's written instructions.

3.4 CLEANING

- A. Clean off excess sealants 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.

3.5 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 the original work.

END OF SECTION 07920

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Steel doors.
 - 2. Steel door frames.

1.02 RELATED SECTIONS

- A. See the following sections for related items and installations.
 - 1. Section 04810 Unit Masonry Assemblies.
 - 2. Section 08211 Flush Wood Doors.
 - 3. Section 08710 Finish Hardware.
 - 4. Section 08800 Glazing for wire glass inserts.

1.03 SUBMITTALS

- A. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- B. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those within the Construction Documents.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.04 QUALITY ASSURANCE

- A. Provide doors and frames complying with the Steel Door Institute Standard ANSI A250.8-1998 (SDI 100) "Recommended Specifications for Standard Steel Doors and Frames" and as specified.
- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Temperature-Rise Rating: Where indicated, provide doors that are rated for maximum of 250 degrees F temperature rise.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Steel Doors and Frames:

- a. Republic Builders Products.
- b. Ceco Corp.
- c. Curries Company
- d. Deansteel Manufacturing Co., Inc.
- e. Steelcraft

2.02 MATERIALS

- A. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.
- B. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 (ASTM A 525M, with Z 180 or ZF 180) coating designation, mill phosphatized.
- C. Supports and Anchors: Fabricated from not less than 0.0478-inch- (1.2-mm-) thick steel sheet; 0.0516-inch- (1.3-mm-) thick galvanized steel where used with galvanized steel frames.
- D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.03 DOORS

- A. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI A250.8-1998 (SDI 100) grades and models specified below, or as indicated on Drawings or schedules:
 1. Interior Doors: Grade II, Heavy-Duty, Model 2, seamless design, minimum 18 gauge thick cold-rolled steel sheet faces.
 2. Exterior Doors: Exterior Doors: Grade III, Extra Heavy-Duty, Model 2, seamless design, minimum 16 gauge thick galvanized steel sheet faces.

2.04 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 0.0598-inch- (1.5-mm-) thick cold-rolled steel sheet.
 1. Fabricate frames with mitered and caulked welded corners.
 2. Interior frames: 16 gauge steel sheet.
 3. Exterior frames: 14 gauge galvanized steel sheet.
- B. Door Silencers: Except on weatherstripped frames, frames to be provided with 9/32" silencer preparation for the receipt of 3 silencers on strike jambs of single-door frames, and 2 silencers on heads of double-door frames.
- C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- D. Grout: Solid grout all frames in contact with masonry construction, as specified in Division 4 Section "Unit Masonry Assemblies."

2.05 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI A250.8-1998 (SDI 100) requirements.
1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
 - a. Resin-impregnated paper honeycomb.
 - b. Rigid polyurethane conforming to ASTM C 591.
 - c. Rigid polystyrene conforming to ASTM C 578.
 - d. Vertical steel stiffeners.
 - e. Rigid mineral fiber with internal sound deadener on inside of face sheets.
 2. Clearances: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors. Not more than 3/4 inch (19 mm) at bottom.
 3. Fire Doors: Provide clearances according to NFPA 80.
- B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel sheet.
- C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- E. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch- (1.6-mm-) thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
1. At exterior locations.
- F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
1. Unless otherwise indicated, provide thermal-rated assemblies with U-value rating of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.
- H. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 1408, and classified according to ASTM E 413.
1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or better.

- I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
 - 1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.
- J. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- K. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- L. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel or 0.040-inch- (1-mm-) thick aluminum.
 - 1. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 - 2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.06 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers and organic finishes to doors and frames after fabrication.

2.07 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with non-petroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 - 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.08 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
 - 2. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
 - 3. Install fire-rated frames according to NFPA 80.
- C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8-1998 (SDI 100).
 - 1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
 - 2. Smoke-Control Doors: Comply with NFPA 105.

END OF SECTION 08110

SECTION 08111 - ALUMINUM DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Flush Aluminum Doors
- B. Aluminum Door Frames.

1.2 RELATED SECTIONS

- A. Division 04: Masonry (frame installation).
- B. Division 07: Joint Sealers
- C. Division 08:
 - 1. Door Hardware
 - 2. Glazing
- D. Division 09: Painting

1.3 REFERENCES

- A. Aluminum Association, Inc. (AA)
 - 1. AA 5005-H14 - Sheet Architectural
 - 2. AA 6061-T6 - Heavy Duty Structures
 - 3. AA 6063-T5 - Extrusions, Pipe, Architectural
 - 4. AA DAF-45 - Designation System for Aluminum Finishes
- B. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA 2603-98 - Pigmented Organic Coatings (Polycron)
 - 2. AAMA 2605-98 - Superior Performing Organic Coatings (Kynar)
 - 3. AAMA 609 - Anodized Architectural Finishes Cleaning and Maintenance
 - 4. AAMA 610-02 - Painted Architectural Products Cleaning and Maintenance.
 - 5. AAMA 611-98 - Anodized Architectural Standards
 - 6. AAMA 701 - Pile Weatherstrip
- C. American Society for Testing Materials (ASTM)
 - 1. A 123 - Zinc (Hot-Dip Galvanized) Coatings
 - 2. C 591-01 - Unfaced Preformed Rigid Cellular Polyisocyanurate
 - 3. C 728-97 - Insulation Board, Mineral Aggregate
 - 4. E 330-97e1 - Structural Performance of Exterior Doors

1.4 TESTING AND PERFORMANCE REQUIREMENTS

- A. Structural Test Unit: Minimum size of 3-feet by 7-feet with 24-inch by 34-inch vision light shall be evaluated compliant with ASTM E 330 testing method
- B. Test Procedures and Performances:

1. With door closed and locked, test unit in accordance with ASTM E 330 at static air pressure difference of 80.0 pounds per square foot (3.83 kPa) positive pressure and 80.0 pounds per square foot negative pressure with 155 miles (249.5 km) per hour wind load.
2. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanism, nor any other damage that would cause the door to be inoperable.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00
- B. Product Data: Manufacturer's descriptive literature for each type door and frame. Include the following information:
 1. Fabrication methods
 2. Finishing
 3. Hardware preparation
 4. Accessories.
- C. Shop Drawings: Indicate the following:
 1. Elevations and details of each door and frame type
 2. Schedule of doors and frames
 3. Conditions at openings with various wall thicknesses and materials
 4. Location and installation requirements for hardware
 5. Thicknesses of materials, joints
 6. Connections and trim
- D. Samples: Two sets of color chips representing specified colors and finishes.
- E. Verification Samples:
 1. Submit samples of each type, consisting of aluminum door corner construction, minimum 6-inch by 6-inch (150 mm) legs.
 2. Where color or texture variations are anticipated, such as anodized finishes, include two or more units in each set of samples indicating extreme limits of variations.
- F. Hardware Templates: Provide finish hardware mounting details.
- G. Manufacturer's Installation Instructions: Printed installation instructions for each product, including product storage requirements.
- H. Operations and Maintenance Data: Printed instructions for each product.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing aluminum door and frame systems of the type required for this project, with minimum ten continuous years documented experience.
- B. Product Qualifications: Wind-load test certification conforming to ASTM E 330 on samples of previous products shall be provided for the type of door to be used.
- C. Installer's Qualifications: Workmen skilled in handling aluminum door and frame systems of the type required for this project.
- D. Instruction: The manufacturer or his representative will be available for consultation to all parties engaged in the project, including instruction to installation personnel.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors and frames palletted, or individually crated. Doors shall be side protected with surrounding grooved 2-inch by 4-inch wood frame and covered with 275-pound test corrugated cardboard.
- B. Inspect delivered doors and frames for damage; unload and store with minimum handling. Repair minor damage if refinished items are equal in all respects to new work; otherwise, remove damaged items and replace with new.
- C. Store products of this section under cover in manufacturer's unopened packaging until installation.
 - 1. Place units on minimum 4-inch wood blocking.
 - 2. Avoid non-vented plastic or canvas covers.
 - 3. Remove packaging immediately if packaging becomes wet.
 - 4. Provide 0.25-inch air spaces between stacked doors.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements of areas to receive aluminum frames; note discrepancies on submitted shop drawings.

1.9 SCHEDULING

- A. Ensure that all approvals and/or shop drawings are supplied or returned to the manufacturer in time for fabrication without affecting construction progress schedule.
- B. Ensure that actual hardware requested by manufacturer are available in time for fabrication without affecting construction progress schedule.

1.10 WARRANTY

- A. Manufacturer: Ten-year warranty against defects in workmanship and materials, including warping, rotting, decaying or bowing.
- B. Installer: Warrant installation procedures and performance for five years against defects due to workmanship and materials handling

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Cline Aluminum Doors, Inc. 112 32nd Avenue West, Bradenton, FL 34205-8907 Phone: (941) 746-4104 Fax: (941) 746-5153 Toll-free: (800) 648-6736 www.ClineDoors.com Email: inquire@clinedoors.com
- B. Requests for substitution will be considered in accordance with provisions of Section 01 60 00. Model: Series 100BE

2.2 COMPONENTS

- A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish.

- B. Flush Aluminum Door Composite Components: Minimum 5-ply composite laminated construction to include:
1. Facing: One-piece 0.040-inch smooth 5005-H14 stretcher-leveled aluminum alloy.
 2. Substrate: One-piece 0.085-inch oil-tempered hardboard; neither pegboard nor non-tempered hardboard shall be accepted.
 3. Core: Pre-stabilized, five pound minimum, EPS foam. No injected foams or poured-in-place foams acceptable to avoid air pockets and destabilization.
 4. Hardware Backup: Provide continuous, nonspecific hardware reinforcement with full internal perimeter aluminum tube, 4.25-inches in width, 0.125-inch minimum wall thickness.
 5. Bonding Agent: Shall be a commercial bonding adhesive with a strength buildup of 350 pounds per square inch
 6. Extrusion Wall: Thickness of 0.125-inch minimum, except beads and trim.
 7. Beads and Trim: Wall Thickness of 0.050-inch minimum. Replaceable lock stile door edge of 6063-T5 extruded aluminum alloy with special beveled edge cap design shall be provided with integral weatherstripping. Hinge lock style to a clip mortise square edge design to accommodate standard weight and heavy weight butt hinges. Use of integral door edging not acceptable.
 8. Weatherstripping: Replaceable wool pile with nylon fabric, polypropylene backing meeting AAMA 701 standards.
 9. Materials: Only nonferrous, non-rusting members shall be acceptable, including tie rods, screws and reinforcement plates.
 10. Regulations: All components and agents to meet EPA standards.
- C. Glazing: Refer to Section 08800
1. Glass shall be 0.25-inch tempered at interior doors
 2. Glass shall be 1-inch insulating, tempered at exterior doors
 3. Stops shall be snap-in, non-removable type, 6063-T5 extruded aluminum alloy and 0.050-inch thickness
 4. Seals shall be vinyl inserts
 5. No fasteners shall be exposed.
- D. Aluminum Frames:
1. Frame Components: Extruded channel (tubular) 6063-T5 aluminum alloy, minimum wall thickness 0.125-inch ; cut corners square and joinery shall be mechanical with no exposed fasteners
 2. Profile: Open Back with Applied Stop (OBS), 1.75-inches by 5-inches
 3. Hinge and Strike Mounting Plates: Extruded aluminum alloy bar stock, 0.1875-inch thick mounted in a concealed integral channel with no exposed fasteners.
 4. Replaceable Weatherstripping: AAMA 701, wool pile with nylon fabric, polypropylene backing, at head and jambs
 5. Door Stop: No screw-on stops acceptable.
 6. Frame Finish: Shall be anodized with Class II mechanical finish to match door finish.

2.3 FINISH

- A. Finish: Clear anodic coating; AA-M12C22A31 Class II mechanical finish, non-specular, with chemical medium matte etch, minimum thickness 0.4-mil
- B. Finish: Medium Bronze anodic coating; AA-M12C22A44 Class I mechanical finish, non-specular as fabricated, with medium-matte chemical etch, minimum thickness 0.4-mil

2.4 FABRICATION

- A. General: Receive hardware if required by manufacturer.
- B. Aluminum Flush Door Construction: Of type, size and design indicated:

1. Minimum Thickness: 1.75-inches, 5-ply composite laminate system. No 3-ply doors accepted for commercial application.
 2. Door Size: Sizes shown are nominal; provide standard clearances as follows:
 3. Hinge and Lock Stiles: 0.125-inch
 4. Between Meeting Stiles: 0.25-inch
 5. At Top Rails: 0.125-inch
 6. Between Door Bottom and Threshold: 0.125-inch
 7. Face Panels: Exterior and interior aluminum panels shall be one-piece stretcher-leveled aluminum alloy, each laminated edge-to-edge to one-piece oil-tempered hardboard substrate.
 8. Substrate: Oil-tempered hardboard substrates shall have 100-percent bilateral lamination to a pre-stabilized, five pound minimum, EPS foam core and internal hardware backup tube.
 9. Reinforcement: Internal tube shall reinforce the full internal door perimeter to allow for all specified and non-specified hardware.
 10. Core: Pre-stabilized, five pound minimum, EPS foam core shall have 100-percent bilateral lamination to facing substrate and to internal reinforcement system.
 11. Door Edge: Door perimeter shall be trimmed with a field replaceable 6063-T5 extruded aluminum alloy, with a beveled edge on the lock stile and a clip mortise squares edged on the hinge stile, to protect door edges.
 12. Weatherstripping: Lock stile of door shall have wool pile weatherstripping applied.
- C. Aluminum Frames: Of shapes and contours indicated.
1. Corners shall be cut square
 2. Reinforce and secure mechanically.

2.5 ACCESSORIES

- A. Fasteners: Aluminum, non-magnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.
1. Do not use exposed fasteners.
- B. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, nonferrous stainless steel.
- C. Bituminous Coating: Cold-applied asphaltic mastic, compounded for 30-mil thickness per coat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.
- B. Verify that frames installed by other trades for installation of doors of this section are in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.

3.2 PREPARATION

- A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions; do not damage □sight-exposed finishes.
- B. Separate dissimilar metals to prevent electrolytic action between metals.

3.3 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings; set frames plumb, square, level, and aligned to receive doors.
- B. Anchor frames to adjacent construction in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.
 - 1. Seal metal-to-metal joints between framing members using elastomeric sealant.
- C. Where aluminum surfaces contact with metals other than stainless steel, zinc or small areas of white bronze, protect from direct contact by one or more of the following methods.
 - 1. Paint dissimilar metal with one coat of heavy-bodied bituminous paint.
 - 2. Apply good quality elastomeric sealant between aluminum and dissimilar metal.
 - 3. Paint dissimilar metal with one coat of primer and one coat of paint recommended for aluminum surface applications.
 - 4. Use non-absorptive tape or gasket in permanently dry locations.
- D. Hang doors with required clearances as follows:
 - 1. Hinge and Lock Stiles: 0.125-inch
 - 2. Between Meeting Stiles: 0.250-inch
 - 3. At Top Rails: 0.125-inch
 - 4. Between Door Bottom and Threshold: 0.125-inch
- E. Adjust doors and hardware to operate properly.
- F. Install glazing in glazing frames.
- G. Install hardware for doors of this section.
 - 1. Installation of door hardware is specified in Section 08 71 00
 - 2. Installation of glass is specified in Section 08 80 00

3.4 CLEANING

- A. Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609.
- B. Do not use abrasive, caustic or acid cleaning agents.

3.5 PROTECTION

- A. Protect products of this section from damage caused by subsequent construction until substantial completion.
- B. Repair damaged or defective products to original specified condition in accordance with manufacturer's recommendations.
- C. Replace damaged or defective products that cannot be repaired to Architect's acceptance.

END OF SECTION 08111

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core prefinished wood doors with stained wood-veneer faces.

1.2 RELATED SECTIONS

- A. Refer to Section 08110 for hollow metal frame requirements.
- B. See Section 08710 Door Hardware.
- C. See Section 08800 Glazing

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate fire ratings for fire doors.
- C. Samples for Verification:
 - 1. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required.
 - 2. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
 - 3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 - 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 - 1. Test Pressure: Test at atmospheric pressure.
 - 2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturers:
 - 1. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Ampco Products, Inc.
 - c. Buell Door Company.
 - d. Eggers Industries; Architectural Door Division.

- e. GRAHAM Manufacturing Corp.
- f. Marshfield
- g. Weyerhaeuser Company.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
- C. Structural-Composite-Lumber-Core Doors:
 - 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf (3100 N).
 - b. Screw Withdrawal, Edge: 400 lbf (1780 N).
- D. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.
- E. Mineral-Core Doors:
 - 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 - 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 - 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Premium, with Grade A faces.
 - 2. Species: **White birch.**
 - 3. Stain: **color per Architect.**
 - 4. Pair and Set Match: Provide for doors hung in same opening.
 - 5. Construction: Seven plies.

2.4 SOLID-CORE DOORS

- A. Particleboard Cores: Comply with the following requirements:
 - 1. Particleboard: ANSI A208.1, Grade LD-2.

- a. Use particleboard made with binder containing no urea-formaldehyde resin.
2. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.

B. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated.
3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
4. Pairs: Furnish formed-steel edges and astragals with intumescent seals for pairs of fire-rated doors, unless otherwise indicated. Finish steel edges and astragals to match door hardware (locksets or exit devices).
5. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

2.5 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors:
- B. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.

2.6 FABRICATION

- A. Fabricate doors in sizes indicated for Project-site fitting.
 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Louvers: Factory install louvers in prepared openings.

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises..
- B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.
- C. Transparent Finish:
 1. Grade: Premium.
 2. Finish: AWI conversion varnish or catalyzed polyurethane system.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08211

SECTION 08331 - OVERHEAD COUNTER DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of manually-operated overhead counter doors:
 - 1. Counter doors.
- B. See Division 5 Section "Metal Fabrications" for miscellaneous steel supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Operation-Cycle Requirements: Provide overhead coiling door components and operators capable of operating for not less than 10,000 cycles and for 5 cycles per day.

1.3 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachment to other work.
- C. Samples: For each exposed finish.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cornell Iron Works Inc.
 - 2. Overhead Door Corp.
 - 3. Pacific Rolling Doors Co.
 - 4. Southwestern Steel Rolling Door Co.
 - 5. Wayne-Dalton Corp.
 - 6. Windsor Door, a MAGNATRAX Corporation.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Interlocking slats in a continuous length for width of door of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door.

1. Stainless-Steel Door Curtain Slats: ASTM A 666, Type 304. Use type 316 in areas exposed to pool.
- B. Bottom Bar: Manufacturer's standard to suit type of curtain slats.
 1. Astragal: Replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene; as a cushion bumper for interior door.
- C. Curtain Jamb Guides: Material and finish to match curtain slats, with sufficient depth and strength to retain curtain, operate smoothly, and to withstand loading.
 1. Removable Posts and Jamb Guides: Manufacturer's standard.
- D. Hood: Form to act as weatherseal and entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods, and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.
 1. Stainless-Steel Hoods: Minimum 0.025-inch- (0.65-mm-) thick stainless-steel sheet, Type 304.
 2. Shape: Round.
- E. Integral Frame, Hood, and Fascia: Welded assemblies:
 1. Stainless-Steel: Minimum 0.0625-inch- (1.6-mm-) thick stainless-steel sheet, Type 304.
- F. Sills: Manufacturer standard bottom edge composed of rubber or neoprene, designed to cushion closure of door edge against solid surface counter below.
- G. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and top of exterior doors, unless otherwise indicated. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
- H. Push/Pull Handles: Galvanized steel lifting handles on each side of door.
 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.
- I. Slide Bolt: Engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- J. Counterbalancing Mechanism: Adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
 1. Manual Door Operator: Push-up (lift- or pull-up) operation not exceeding 25 lbf (111 N).

2.3 FINISHES

- A. Stainless-Steel Finish: Selected by Architect from door manufacturer's standard finishes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports
- B. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion, and with weathertight fit around entire perimeter.

3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain doors. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 08331

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes aluminum entrances and storefronts for exterior and interior locations.

1.2 RELATED SECTIONS

- A. Section 08520 Aluminum Windows
- B. Section 08710 Finish Hardware.

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Thermally Broken Construction: Where indicated by product selection, provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.
- D. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
 - 1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch (19 mm), whichever is smaller, unless otherwise indicated.
 - 2. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
 - a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
 - b. Duration: As required by design wind velocity; fastest 1 mile (1.609 km) of wind for relevant exposure category.
- E. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
 - 1. Provide a minimum 1/8-inch (3.18-mm) clearance between members and top of glazing or other fixed part immediately below.
 - 2. Provide a minimum 1/16-inch (1.59-mm) clearance between members and operable windows and doors.

- F. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads without failure of materials or permanent deformation.
- G. Air Infiltration: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. (0.3 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. (75.2 Pa).
- H. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 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. (299 Pa). Water leakage is defined as follows:
1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- I. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- J. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.
- K. Entrances resistant to corners racking shall be tested by the dual moment load test as follows:
1. Test section shall consist of a standard top door corner assembly. Side rail section shall be 24 inches long and top rail shall be 12 inches long.
 2. Anchor "top rail" positively to test bench so that the end of the top rail protrudes 3 inches beyond the bench edge.
 3. Anchor a lever arm positively to "side rail" at a point 19 inches from the inside edge of "top rail". Attach weight support pad at a point of 19 inches from inner edge of "side rail".
 4. Test section shall withstand a load 245 pounds on the lever arm before reaching the point of failure, which shall be considered a rotation of the lever arm in excess of 45 degrees.
- L. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.
- M. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
1. Include manufacturer's installation instructions in accordance with Section 01600 Product Requirements.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Framing and Glazing Components: Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and licensed in the State of New Mexico.

2. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- E. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
- B. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Subcontractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 1. Structural failures including, but not limited to, excessive deflection.
 2. Failure of system to meet performance requirements.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Failure of operating components to function normally.
 5. Water leakage through fixed glazing and frame areas.
- C. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturers:
 - 1. Kawneer Company, Inc.;
 - a. Exterior: Trifab VG 451T thermally broken.
 - b. Interior: TriFab VG 451, (not thermally broken).
 - c. Entrances: Kawneer Tuffline™ Series 500 wide stile.

- B. Other Available Manufacturers:
 - 1. Arcadia, Inc.
 - 2. Butler Manufacturing Company; Vistawall Architectural Products.
 - 3. International Aluminum Corporation; U.S. Aluminum.
 - 4. Manko Window Systems Inc.
 - 5. Tubelite Architectural Systems.
 - 6. YKK

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
 - 5. Welding Rods and Bare Electrodes: AWS A5.10.

- B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.

- C. Glazing as specified in Division 8 Section "Glazing."

- D. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."

- E. 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.

2.3 COMPONENTS

- A. Door Openings: Provide manufacturer's standard glazed doors. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.

- B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.

- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Reinforce members as required to retain fastener threads.
 - 2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

- E. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system.
- F. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
 - 1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.

2.4 HARDWARE

- A. See Section 08710 Finish Hardware.
- B. Hardware Coordination: Entrance door installer shall assume full responsibility for coordination and installation of entrance door hardware. Notify the Architect of any conflicts between listed products and hardware selections.
- C. Hardware selections:
 - 1. Continuous Hinges with non-removable pins.
 - 2. Threshold: Provide ADA-compliant extruded aluminum threshold with slip-resistant surface. Maximum profile: 1/2" AFF.
- D. Operators
 - 1. An ADA push button on each side of door and shall be 2' - 10" from floor to center; with a minimum of 3'-0" from edge of door in open position of pull side and 12" minimum of push side. Mount ADA push lever handles with panic devices.

2.5 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 1. Fabricate components for screw-spline frame construction.
 - 2. Fabricate components for head- and sill-receptor frame construction with shear-block construction at intermediate horizontal components.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. 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.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
 - 1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames.

2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Color Anodic Finish: Class I, color anodic coating complying with AAMA 611.
 - 1. Color: Medium bronze.

2.7 STEEL PRIMING

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
- B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.
- C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
- H. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.
- I. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
 - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm). Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08410

SECTION 08520 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Commercial Grade Aluminum Windows, including glass and glazing at window manufacturer's factory, perimeter trims, sills and stools, window installation hardware and accessories, shims and anchors, and perimeter sealing of window units.
- B. Types of Aluminum Windows include: Thermal, 4" Deep Master Frame, Horizontal Sliding (HC55)
- C. Drawings indicate window types, dimensions, glazing requirements and operation

1.2 RELATED SECTIONS

- A. Section 07920: ELASTOMERIC SEALANTS
- B. Section 08410: ALUMINUM STOREFRONTS AND ENTRANCES
- C. Section 08800: GLAZING

1.3 SYSTEM DESCRIPTION

- A. Reference Standard Compliance: Comply with ANSI/AAMA 101 for minimum performance criteria for aluminum windows, including grade designation windows units.
 - 1. Test Units: Conform to minimum size in accordance with ANSI/AAMA 101 for each test unit sizes and configurations. Units submitted for laboratory testing shall be manufacturer's standard construction, glazed and assembled in accordance with manufacturer's specifications and ANSI/AAMA 101.
- B. Window Performance Requirements:
 - 1. Air Infiltration: When closed and locked, the test specimen shall be tested in accordance with ASTM E283 at a minimum frame size of 66" x 120" (HC). Air infiltration rate shall not exceed 0.30 cfm/ft of sash perimeter at a static air pressure differential of 1.57 psf.
 - 2. Water Resistance: When closed and locked, the test specimen shall be tested in accordance with ASTM E547 and ASTM E331 at a minimum frame size of 66" x 120" (HC). There shall be no leakage as defined in test method at a static air pressure differential of 10 psf.
 - 3. Uniform Load Deflection: When closed and locked, a minimum static air pressure difference of 65 psf shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member.
 - 4. Uniform Load Structural Test: When closed and locked, a minimum static air pressure difference of 97.5 psf shall be applied in the positive and negative direction in accordance with ASTM E330. The unit shall be evaluated after each load.
 - 5. Thermal Transmittance (U-value): When tested to AAMA Specification 503.1, the thermal transmittance (U-value) shall not be more than 0.70 BTU/hr/sf°F.
 - 6. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 49.
- C. System Performance Requirements: Provide aluminum windows which have been manufactured, fabricated and installed to withstand uniform loads from 65 psf and to maintain (manufacturer's performance criteria) without defects, damage, or failure.

1.4 SUBMITTALS

- A. General: Contractor shall prepare, review, approve, and submit product data, shop drawings, samples, and other submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections.
- B. Product Data: Submit manufacturer's technical product data, recommendations, and standard details for aluminum window units, including certified test laboratory reports as necessary to show compliance with requirements.
- C. Shop Drawings: Submit shop drawings, including wall elevations at 1/14" scale, typical unit elevations at 3/4" scale, and full size detail sections of every typical composite member. Show anchors, hardware, operators, and other components not included in manufacturer's standard data. Include glazing details.
- D. Samples: Submit samples of each required aluminum finish, on 12" long sections of extrusion shapes as required for window units. Architect reserves the right to require additional samples which will show fabrication techniques, workmanship of component parts, and design of hardware and other exposed auxiliary items.
- E. Certification: Where manufacturer's standard window units comply with requirements and have been tested in accordance with specified tests, provide certification by manufacturer showing compliance with such tests; otherwise, perform required tests through a recognized testing laboratory or agency and provide certified test results.

1.5 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
 - 1. Warranty Period: Two (2) years from Date of Substantial Completion of the project
 - 2. Insulating Glass: Warranted to be free from defects (excluding breakage) for a period of five (5) years.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Installer experienced to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
 - 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Sealair 8400TL manufactured by Kawneer Company, Inc.
 - 1. Manufacturer of Products of this Section shall be the same as the manufacturer of Section 08410. see Section 08410 for list of approved manufacturers

2.2 MATERIALS

- A. Aluminum (Windows and Components):
 - 1. Material Standard: ASTM B221, G.S. 10A-T5; 6063-T5 alloy and temper.
 - 2. Frame Depth: Not less than 4"

3. Member Wall Thickness: Each master frame member shall have minimum wall thickness of 0.070" and shall provide structural strength to meet specified performance requirements. Each sash member shall have a minimum wall thickness of 0.070". All horizontal sash members shall be tubular construction. Meeting rail shall have a continuous interlock with double weather stripping.
 4. Dimensions: Reference to dimensions for wall thickness and other cross-sectional dimensions of window members are nominal and in compliance with ANSI H35.2-1990. Finish/Color: Permanodic® AA-M12C22A44, AAMA 611, Architectural Class I Anodic Coating Medium Bronze Product(s)/System(s) Testing: ANSI/AAMA: Comply with ANSI/AAMA 101 and AAMA 910 for minimum product performance criteria.
- B. Mullions and Cover Plates: Shall be extruded aluminum of 6063-T5 alloy and temper of profile and dimensions indicated on drawings. Mullions shall provide structural properties to resist wind pressure required by performance criteria and standards.
- C. Thermal Barrier:
1. Frame thermal barrier shall be a minimum of 5/16" separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum.
 2. Sash thermal barrier shall be a minimum of 1/4" separation consisting of a two-part, chemically curing high density polyurethane in conditioned thermal pockets which is mechanically and adhesively bonded to the aluminum.
- D. Accessories:
1. Fasteners: Where exposed, shall be 300 Series, Stainless Steel.
 2. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- E. Hardware: Manufacturer's standard corrosion resistant hardware material compatible with aluminum
1. Stainless Steel Roller Track
- F. Exterior Panning and Interior Trims as indicated on the drawings: Extruded aluminum, 6063-T5 alloy and temper, extruded to profiles and details indicated. Seal exterior joints with manufacturer's standard sealant to assure water-tight joints.
- G. Insect Screens on operable units: Extruded aluminum frames, 6063-T5 alloy and temper, joined at corners; 18 x 16 mesh aluminum screen cloth; frames finished to match aluminum windows; splines shall be extruded vinyl, removable to permit rescreening.

2.3 GLASS AND GLAZING

- A. General: Glass thickness and type shall be in accordance with manufacturer's recommendations for prescribed design pressure. Factory glazing shall be in accordance with manufacturer's standard requirements.
1. Material Compatibility: Glazing materials shall be compatible with adjacent components.
 2. Manufacturer's Standards: Glazing method shall be a wet/dry type glazed in accordance with manufacturer's standards. Exterior glazing shall be pre-shimmed glazing tape. Interior glazing shall be snap-in type 0.062" glazing beads and a compression gasket of dense elastomer in accordance with ASTM C864.
- B. Glass Materials: Refer to Section 08800 GLAZING for colors and coatings
1. Annealed Glass: ASTM C1036.
 2. Insulating Glass: ASTM E774
 3. Safety Glazing: ANSI Z97.1 or CPSC 16 CFR 1201.
 4. Glass Thickness: 1" consisting of 1/4" exterior 1/2" spacer 1/4" interior.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS/RECOMMENDATIONS

- A. Compliance: Comply with manufacturer's product installation data and recommendations for installation requirements of window units, hardware, and other components in accordance with manufacturer's warranty provisions.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive window units and sill plate is level in accordance with manufacturer's acceptable tolerances.
 - 1. Field Measurements: Verify field measurements for window installation.

3.3 PREPARATION

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.4 INSTALLATION

- A. General: Install window units plumb, level, and true to line, without warp or rack of frames or sash with manufacturer's prescribed tolerances. Provide support and anchor in place.
 - 1. Dissimilar Materials: Provide separation of aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points by complying with AAMA 101, Appendix, titled "Dissimilar Materials."
 - 2. Weathertight Construction: Install sill members and other members in a bed of sealant or with joint filler or gaskets, to provide weathertight construction. Coordinate installation with wall flashings and other components of construction.
 - a. Refer to Division 7 Joint Treatments (Sealants) for installation requirements.

3.5 ADJUSTING AND CLEANING

- A. Adjusting: Adjust operating window components to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.
- B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- C. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum windows from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants. Remove and replace damaged aluminum windows at no extra cost.

END OF SECTION 08520

SECTION 08710 - FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY:

- A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
 - 1. Door hardware for steel (hollow metal) doors.
 - 2. Door hardware for aluminum doors.
 - 3. Door hardware for wood doors.
 - 4. Door hardware for other doors indicated.
 - 5. Keyed cylinders as indicated.
- B. Intent of Hardware Groups
 - 1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
 - 2. Where items of hardware aren't definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.
- C. Allowances
 - 1. Refer to Section 01210 for allowance amount and procedures.
- D. Alternates
 - 1. Refer to Section 01230 for Alternates and procedures.

1.02 SUBSTITUTIONS:

- A. Comply with Section 01600

1.03 SUBMITTALS:

- A. Comply with Section 01330
- B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.
- C. Product Data: Manufacturer's specifications and technical data including the following:
 - 1. Detailed specification of construction and fabrication.
 - 2. Manufacturer's installation instructions.
 - 3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
 - 4. Submit 6 copies of catalog cuts with hardware schedule.
- D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.
 - 1. List groups and suffixes in proper sequence.
 - 2. Completely describe door and list architectural door number.
 - 3. Manufacturer, product name, and catalog number.
 - 4. Function, type, and style.

5. Size and finish of each item.
 6. Mounting heights.
 7. Explanation of abbreviations and symbols used within schedule.
 8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.
- E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.
- F. Samples: (If requested by Architect in writing)
1. 1 sample of Lever and Rose/Escutcheon design, (pair).
 2. 3 samples of metal finishes
- G. Contract Closeout Submittals: Comply with Section 01700 including specific requirements indicated.
1. Operating and maintenance manuals: Submit 1 set containing the following.
 - a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 2. Copy of final hardware schedule, edited to reflect, "As installed".
 3. Copy of final keying schedule
 4. As installed "Wiring Diagrams" for each piece of hardware connected to power, both low voltage and 110 volts.
 5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.04 QUALITY ASSURANCE

- A. Comply with Section 01430.
1. Statement of qualification for distributor and installers.
 2. Statement of compliance with regulatory requirements and single source responsibility.
 3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.
 - a. Distributor to employ full time Architectural Hardware Consultants (AHC) or an equivalent person with 20 years of Architectural Hardware experience for the purpose of scheduling and coordinating hardware and establishing keying schedule.
 - b. Hardware Schedule shall be prepared and signed by an AHC.
 4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
 5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
 - a. Provide UL listed hardware for labeled and 20-minute openings in conformance with requirements for class of opening scheduled.
 - b. Underwriters Laboratories requirements have precedence over this specification where conflicts exist.
 6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.
- B. Review Project for extent of finish hardware required completing the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and

furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Comply with Section 01600.
 - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
 - 2. Package hardware to prevent damage during transit and storage.
 - 3. Mark hardware to correspond with "reviewed hardware schedule".
 - 4. Deliver hardware to door and frame manufacturer upon request.
- B. Storage and Protection: Comply with manufacturer's recommendations.

1.06 PROJECT CONDITIONS:

- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.07 WARRANTY:

- A. Refer to Conditions of the Contract
- B. Manufacturer's Warranty:
 - 1. Closers: Ten years
 - 2. Exit Devices: Three Years
 - 3. Locksets & Cylinders: Three years
 - 4. All other Hardware: Two years.

1.08 OWNER'S INSTRUCTION:

- A. Instruct Owner's personnel in operation and maintenance of hardware units.

MAINTENANCE:

- A. Extra Service Materials: Deliver to Owner extra service materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.
 - 1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
 - 2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
 - 3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.
- B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1, paragraph 1.02 A.

<u>Item:</u>	<u>Manufacturer:</u>	<u>Approved:</u>
Hinges	Ives	Bommer, Stanley, Hager
Continuous Hinges	Ives	Select, Pemko
Locksets & Cylinders	Schlage	Best, Sargent
Exit Devices	Von Duprin	Precision, Sargent
Closers	LCN	Norton, Sargent
Door Trim	Ives	Rockwood, Trimco, Don-Jo
Overhead Stops	Glynn-Johnson	ABH, LCN
Thresholds & Gasketing	National Guard	Pemko, Reese, Hager

2.02 MATERIALS:

- A. Hinges:
1. Template screw hole locations
 2. Minimum of 2 stainless ball bearings
 3. Equip with easily seated, non-rising pins
 4. Sufficient size to allow 180-degree swing of door
 5. Furnish hinges with five knuckles
 6. Provide hinge type as listed in schedule.
 7. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
 8. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
 9. UL10B listed for Fire
- B. Geared Continuous Hinges:
1. Tested and approved by BHMA for ANSI A156.26-1996 Grade 1
 2. Anti-spinning through fastener
 3. UL10B listed for 3 hour Fire rating
 4. Non-handed
 5. Lifetime warranty
 6. Provide Fire Pins for 3-hour fire ratings
 7. Sufficient size to permit door to swing 180 degrees
- C. Mortise Type Locks and Latches:
1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C
 2. Fit ANSI A115.1 door preparation
 3. Functions and design as indicated in the hardware groups
 4. One-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel
 5. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
 6. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended
 7. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
 8. Provide sufficient curved strike lip to protect door trim
 9. Lever handles must be of extruded, forged or cast stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable

10. Lock shall have self-aligning, thru-bolted trim
 11. Levers to operate a roller bearing spindle hub mechanism
 12. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
 13. Spindle to be designed to prevent forced entry from attacking of lever
 14. Provide locksets with interchangeable core cylinders
 15. Each lever to have independent spring mechanism controlling it
 16. Core face must be the same finish as the lockset
- D. Exit Devices shall:
1. Exit devices as scheduled with push-through pad design, no exposed touch bar fasteners, no exposed cavities when operated.
 2. Provide certification by independent testing laboratory that specified devices have completed over 1,000,000 cycles and still perform in accordance to ANSI/BHMA A156.3 - 1994.
 3. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
 4. Mechanism case shall have an average thickness of .140"
 5. Compression spring engineering.
 6. Non-handled basic device design with center case interchangeable with all functions.
 7. All devices shall have quiet return fluid dampeners.
 8. All latchbolts for wide stile devices shall be deadlocking with 3/4" throw and have a self-lubricating coating to reduce friction and wear.
 9. Device push bar must release when a force of 32 pounds, or less, of pressure is applied when a force of 250 pounds is applied to the door.
 10. Device shall bear UL label for fire and or panic as may be required.
 11. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
 12. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
 13. Removable Mullions: Removable with single turn of building key, securely reinstalled without need for key.
 14. Furnish glass bead kits for vision lites where required. Devices for flush doors must fit flat on the door.
- E. Door Closers shall:
1. Tested and approved by BHMA for ANSI 156.4, Grade 1
 2. UL10C certified
 3. Closer shall have extra-duty arms and knuckles
 4. Conform to ANSI 117.1
 5. Maximum 2 7/16 inch case projection with non-ferrous cover
 6. Separate adjusting valves for closing and latching speed, and backcheck
 7. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
 8. Full rack and pinion type closer with 1½" minimum bore
 9. Mount closers on non-public side of door, unless otherwise noted in specification
 10. Closers shall be non-handed, non-sized and multi-sized 1 through 6
 11. All closers shall be supplied with forged steel main arms
- F. Kickplates: Provide 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish manufacturers standard screws to match finish.
- G. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.
- H. Key Control: Provide one wall mounted key cabinet complete with hooks, index and tags.
- I. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.
- J.

2.03 FINISH:

- A. Designations used in Schedule of Finish Hardware - 3.04, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products
- B. Powder coat door closers to match other hardware, unless otherwise noted.
- C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.04 KEYS AND KEYING:

- A. Provide keyed construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.
- B. Cylinders, interchangeable core system
- C. Permanent cylinders/cores shall be keyed/combinated in sets or subsets, master keyed or great grand master keyed, as directed by Owner. Permanent keys and cylinders/cores shall be marked with the applicable blind code for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate - Patented". Keys and cylinder identification stamping to be approved by Architect and Owner. Failure to properly comply with these requirements may be cause to require replacement of all or any part of the cylinders and keys involved as deemed necessary at no additional cost to the Owner.
- D. Equip locks and cylinders with patent protected, full size cores with nickel silver blocking pin to check for patented feature on keys. Provide a minimum of six pins with nickel silver bottom pins. Cylinders must allow for multiplex master keying, combinated to Owner's instructions.
- E. All keys shall be made of nickel silver.
- F. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.
- G. Furnish keys in the following quantities:
 - 1 each Grand Masterkeys
 - 4 each Masterkeys
 - 2 each Change keys each keyed core
 - 15 each Construction masterkeys
 - 1 each Control keys
- H. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.
- I. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
 - 1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 HARDWARE LOCATIONS:

- A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
 - 1. Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
 - 2. NWWDA Industry Standard I.S.1.7, Hardware Locations for Wood Flush Doors.

3.03 INSTALLATION:

- A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- B. Conform to local governing agency security ordinance.
- C. ADA Standard: Conform to ANSI A117.1 for positioning requirements for disabled.
- D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

3.04 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

- A. Contractor/Installer Field Services: After installation is complete, Contractor shall inspect completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
 - 1. Check and adjust closers to ensure proper operation.
 - a. Adjust closer to complete full closing cycle in less than 4 to 6 seconds without abrupt change of speed between "Sweep" and "Latch" speeds.
 - b. Adjust "Backcheck" according to manufacturer's instructions.
 - c. Set exterior doors closers to have 8.5 lbs maximum pressure to open, interior non-rated at 5 lbs, rated openings at 12lbs
 - 2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
 - a. Verify levers are free from binding.
 - b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.
 - 3. Report findings, in writing, to the Architect and Hardware Supplier outlining corrective actions and recommendations.

3.05 SCHEDULE OF FINISH HARDWARE:

A. Manufacturer's Abbreviations:

<u>Code</u>	<u>Name</u>
IVE	Ives
SCH	Schlage
VON	Von Duprin
LCN	LCN
NGP	National Guard
TEL	Telkee

B. Hardware Sets:

HW SET: 01
DOOR NUMBER:
100A

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	MULLION	5754	628	VON
1	EA	PANIC HARDWARE	99EO	626	VON
1	EA	PANIC HARDWARE	99NL-OP	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
2	EA	OFFSET DOOR PULL	8190-0	630	IVE
2	EA	SURFACE CLOSER	4021 X 18G X SRI X TB	689	LCN
2	EA	WALL STOP	WS407CVX	630	IVE
1	EA	THRESHOLD	425E X D.W.	AL	NGP
2	SET	DOOR BOTTOM	BY DOOR SUPPLIER		
1	SET	WEATHERSTRIP	BY FRAME SUPPLIER		

HW SET: 02
DOOR NUMBER:
101A

2	EA	POWER TRANSFER	EPT-2	689	VON
2	EA	CONTINUOUS HINGE	224HD X EPT CUT-OUT	628	IVE
1	EA	MULLION	5754	628	VON
1	EA	PANIC HARDWARE	LX99EO	626	VON
1	EA	PANIC HARDWARE	LX99NL-OP	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
2	EA	OFFSET DOOR PULL	8190-0	630	IVE
1	EA	AUTO. OPERATOR	9553 REG	628	LCN
3	EA	WALL PLATE SWITCH	7910-956	630	LCN
1	EA	ROCKER SWITCH	7930-220		LCN
2	EA	DOOR SEQUENCER	7940-149		LCN
1	EA	OVERHEAD STOP	900S X SNB	630	GLY
1	EA	WALL STOP	WS407CVX	630	IVE
1	EA	THRESHOLD	425E X D.W.	AL	NGP
2	SET	DOOR BOTTOM	BY DOOR SUPPLIER		
1	SET	WEATHERSTRIP	BY FRAME SUPPLIER		

NOTE: Wall plate switches shall be wired in series with the "lx" switch in the exit device. Such that when the exit device is "dogged" (unlocked) the wall plate switches are active and the operator will open the door. When the exit device in not "dogged" (locked) the wall plate switches are not active and the operator will not open the door.

RATON AQUATIC CENTER
Raton, New Mexico

HW SET: 03
 DOOR NUMBER:
 101B

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	224HD	628	IVE
2	EA	PULL/PUSHBAR	9190-0	630	IVE
1	EA	AUTO. OPERATOR	9553 REG	628	LCN
1	EA	OVERHEAD STOP	900S X SNB	630	GLY
1	EA	WALL STOP	WS407CVX	630	IVE
1	SET	WEATHERSTRIP	BY FRAME SUPPLIER		

HW SET: 04
 DOOR NUMBER:
 103A 105A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	CLASSROOM LOCK	L9070R 93A	630	SCH
1	EA	WALL STOP	WS407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 05
 DOOR NUMBER:
 104A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	OFFICE LOCK	L9050R 93A	630	SCH
1	EA	WALL STOP	WS407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 06
 DOOR NUMBER:
 107A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	CLASSROOM LOCK	L9070R 93A	630	SCH
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	WALL STOP	WS407CVX	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
3	EA	SILENCER	SR66	GRY	IVE

RATON AQUATIC CENTER
Raton, New Mexico

HW SET: 07
 DOOR NUMBER:
 107B

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	9947EO	626	VON
1	EA	PANIC HARDWARE	9947NL-OP	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
2	EA	OFFSET DOOR PULL	8190-0	630	IVE
2	EA	SURFACE CLOSER	4021 X 18G X SRI X TB	689	LCN
2	EA	WALL STOP	WS407CVX	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
2	SET	DOOR BOTTOM	BY DOOR SUPPLIER		
1	SET	WEATHERSTRIP	BY FRAME SUPPLIER		
1	SET	ASTRAGAL	BY DOOR SUPPLIER		

HW SET: 08
 DOOR NUMBER:
 107C

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	99NL-OP	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	OFFSET DOOR PULL	8190-0	630	IVE
1	EA	SURFACE CLOSER	4021 X 18G X SRI X TB	689	LCN
1	EA	OVERHEAD STOP	900S X SNB	630	GLY
1	EA	THRESHOLD	425E X D.W.	AL	NGP
1	SET	DOOR BOTTOM	BY DOOR SUPPLIER		
1	SET	WEATHERSTRIP	BY FRAME SUPPLIER		

HW SET: 09
 DOOR NUMBER:
 108A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	L9080R 93A	630	SCH
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	WALL STOP	WS407CVX	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
3	EA	SILENCER	SR66	GRY	IVE

RATON AQUATIC CENTER
Raton, New Mexico

HW SET: 10
DOOR NUMBER:
109A

EACH TO HAVE:

6	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
2	EA	MANUAL FLUSH BOLT	FB458-12"	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080R 93A	630	SCH
1	EA	SURFACE CLOSER	4111 HCUSH X SRI X TB	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
2	EA	DOOR SWEEP	200NSS X D.W.	630	NGP
1	SET	SEALS	129NSS X D.S.	630	NGP
1	EA	ASTRAGAL	139SS X 5050B X D.H.	630	NGP

HW SET: 11
DOOR NUMBER:
110A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	L9080R 93A	630	SCH
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	OVERHEAD STOP	900S X SNB	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
1	EA	DOOR SWEEP	200NSS X D.W.	630	NGP
1	SET	SEALS	129NSS X D.S.	630	NGP

HW SET: 12
DOOR NUMBER:
110B

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	224HD	628	IVE
2	EA	MANUAL FLUSH BOLT	FB458-12"	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080R 93A	630	SCH
1	EA	SURFACE CLOSER	4111 CUSH X SRI X TB	689	LCN
1	EA	DOOR HOLDER	PAH-60 X SRI X TB	689	LCN
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
2	EA	DOOR SWEEP	200NSS X D.W.	630	NGP
1	SET	SEALS	129NSS X D.S.	630	NGP
1	SET	ASTRAGAL	BY DOOR SUPPLIER		
1	EA	LOCK GUARD	LG7	630	IVE

RATON AQUATIC CENTER
Raton, New Mexico

HW SET: 13
 DOOR NUMBER:
 111A

EACH TO HAVE:

3	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	99NL	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	SURFACE CLOSER	4111 HCUSH X SRI X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
1	EA	DOOR SWEEP	200NSS X D.W.	630	NGP
1	SET	SEALS	129NSS X D.S.	630	NGP

HW SET: 14
 DOOR NUMBER:
 112A

EACH TO HAVE:

6	EA	CONTINUOUS HINGE	224HD	628	IVE
2	EA	MANUAL FLUSH BOLT	FB458-12"	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	PANIC HARDWARE	9975NL	626	VON
1	EA	MORTISE CYLINDER	20-061	626	SCH
1	EA	SURFACE CLOSER	4111 HCUSH X SRI X TB	689	LCN
1	EA	DOOR HOLDER	PAH-60 X SRI X TB	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
2	EA	DOOR SWEEP	200NSS X D.W.	630	NGP
1	SET	SEALS	129NSS X D.S.	630	NGP
1	EA	ASTRAGAL	139SS X 5050B X D.H.	630	NGP
1	EA	LOCK GUARD	LG7	630	IVE

HW SET: 15
 DOOR NUMBER:
 113A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	L9080R 93A	630	SCH
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CVX	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
1	EA	DOOR SWEEP	200NSS X D.W.	630	NGP
1	SET	SEALS	129NSS X D.S.	630	NGP

RATON AQUATIC CENTER
Raton, New Mexico

HW SET: 16
 DOOR NUMBER:
 113B

EACH TO HAVE:

6	CONTINUOUS HINGE	224HD	628	IVE
2	EA MANUAL FLUSH BOLT	FB458-12"	626	IVE
1	EA DUST PROOF STRIKE	DP2	626	IVE
1	EA ENTRANCE LOCK	L9453R 93A	630	SCH
1	EA SURFACE CLOSER	4111 CUSH X SRI X TB	689	LCN
1	EA DOOR HOLDER	PAH-60 X SRI X TB	689	LCN
1	EA THRESHOLD	513SS X SIA X D.W.	630	NGP
2	EA DOOR SWEEP	200NSS X D.W.	630	NGP
1	SET SEALS	129NSS X D.S.	630	NGP
1	EA ASTRAGAL	139SS X 5050B X D.H.	630	NGP
1	EA LOCK GUARD	LG7	630	IVE

HW SET: 17
 DOOR NUMBER:
 114A 114B 114C

EACH TO HAVE:

2	EA CONTINUOUS HINGE	224HD	628	IVE
1	EA MULLION	5754	628	VON
1	EA PANIC HARDWARE	99EO	626	VON
1	EA PANIC HARDWARE	99NL-OP	626	VON
1	EA RIM CYLINDER	20-057	626	SCH
2	EA OFFSET DOOR PULL	8190-0	630	IVE
2	EA SURFACE CLOSER	4021 X 18G X SRI X TB	689	LCN
2	EA OVERHEAD STOP	900S X SNB	630	GLY
1	EA THRESHOLD	513SS X D.W.	630	NGP
2	SET DOOR BOTTOM	BY DOOR SUPPLIER		
1	SET WEATHERSTRIP	BY FRAME SUPPLIER		

HW SET: 18
 DOOR NUMBER:
 115A

EACH TO HAVE:

3	CONTINUOUS HINGE	224HD	628	IVE
1	EA PANIC HARDWARE	99NL	626	VON
1	EA RIM CYLINDER	20-057	626	SCH
1	EA SURFACE CLOSER	4111 CUSH X SRI X TB	689	LCN
1	EA KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA THRESHOLD	425E X D.W.	AL	NGP
1	EA DOOR SWEEP	200NA X D.W.	AL	NGP
1	SET SEALS	160S X D.S.	AL	NGP

RATON AQUATIC CENTER
Raton, New Mexico

HW SET: 19
 DOOR NUMBER:
 115B

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	PANIC HARDWARE	99NL	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	SURFACE CLOSER	4021 X 18G X SRI X TB	689	LCN
1	EA	WALL STOP	WS407CVX	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
1	EA	DOOR SWEEP	200NSS X D.W.	630	NGP
1	SET	SEALS	129NSS X D.S.	630	NGP

HW SET: 20
 DOOR NUMBER:
 116A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	L9080R 93A	630	SCH
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	WALL STOP	WS407CVX	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
1	SET	DOOR BOTTOM	BY DOOR SUPPLIER		
1	SET	WEATHERSTRIP	BY FRAME SUPPLIER		

HW SET: 21
 DOOR NUMBER:
 119A 127A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	OFFSET DOOR PULL	8190-0	630	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CVX	630	IVE
3	EA	SILENCER	SR66	GRY	IVE

RATON AQUATIC CENTER
Raton, New Mexico

HW SET: 22
DOOR NUMBER:
119B 127B

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	MORTISE DEADBOLT	L463R	630	SCH
1	EA	OFFSET DOOR PULL	8190-0	630	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CVX	630	IVE
3	EA	SILENCER	SR66	GRY	IVE

HW SET: 23
DOOR NUMBER:
120A 121A

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	PRIVACY SET	L9040 93A	626	SCH
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CVX	630	IVE
3	EA	SILENCER	SR66	GRY	IVE

HW SET: 24
DOOR NUMBER:
122A

EACH TO HAVE:

6	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	9947EO	626	VON
1	EA	PANIC HARDWARE	9947NL-OP	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
2	EA	OFFSET DOOR PULL	8190-0	630	IVE
2	EA	SURFACE CLOSER	4021 X 18G X SRI X TB	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	ASTRAGAL	139SS X 5050B X D.H.	630	NGP
2	EA	WALL STOP	WS407CVX	630	IVE

HW SET: 25
DOOR NUMBER:
123A 124A

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	OFFICE LOCK	L9050R 93A	630	SCH
1	EA	SURFACE CLOSER	4011 X SRI X TB	689	LCN
1	EA	WALL STOP	WS407CVX	630	IVE
1	EA	THRESHOLD	513SS X SIA X D.W.	630	NGP
1	SET	DOOR BOTTOM	BY DOOR SUPPLIER		
1	SET	WEATHERSTRIP	BY FRAME SUPPLIER		

RATON AQUATIC CENTER
Raton, New Mexico

HW SET: 26
DOOR NUMBER:
002

EACH TO HAVE:

3	EA	BALL BEARING HINGE	5BB1 4.5 x 4.5	630	IVE
1	EA	PANIC HARDWARE	99NL-OP	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	OFFSET DOOR PULL	8190-0	630	IVE
1	EA	SURFACE CLOSER	4021 X 18G X SRI X TB	689	LCN

HDW SET 99
DOOR NUMBER: MISC
EACH TO HAVE:

100	EA	KEY BLANKS	35-002 STAMPED "DO NOT DUPLICATE"	SCH
1	EA	KEY CABINET	ARISTOCRATE SERIES - 150% OF CYLINDERS	TEL

END OF SECTION 08710

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes glazing for the following:
1. Aluminum Entrances and Storefronts.
 2. Steel Doors and Frames.
 3. Flush Wood Doors.

1.02 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

1.03 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 2. Specified Design Wind Loads: As indicated.
 3. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - a) Load Duration: 60 seconds or less.
 5. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action. Load Duration: 30 days.
 6. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - a) For monolithic-glass lites heat treated to resist wind loads.

7. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
 8. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 2. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
 3. Solar Optical Properties: NFRC 300.

1.04 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated including warranty.
- B. Samples of glass colors and styles selected by Architect.
- C. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.
1. Insulated glazing units: manufacturer's standard composed of specified glass.
- D. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:
1. Float glass.
 2. Low E.
 3. Glazing sealants.
 4. Glazing gaskets.
- E. Certification by manufacturer that products supplied comply with performance requirements specified.
- F. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

- A. Referenced Standards: Comply with published standards of Flat Glass Marketing Association, latest edition and all applicable manufacturer's recommendations.
1. Insulated Glass: Insulated glass shall meet performance requirements of ASTM E774 (Class CBA). Insulating glass units shall be manufactured by a member of Insulating Glass Certification Council (IGCC) or Sealed Insulating Glass Manufacturing Association (SIGMA). Units shall be double sealed with ½-inch minimum air space, a single seal is not acceptable.
- B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.

- C. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- E. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- G. Certified Safety Glazing: Category II products complying with test requirements of 16 CFR 1201 and ANSI Z97.1, certified by Safety Glazing Certification Council, and permanently labeled.
- H. 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.

1.06 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Final Acceptance.
- C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Final Acceptance.
- D. Security Glazing Warranty: Submit a written warranty, executed by manufacturer, agreeing to replace modified ionomer laminates that delaminate within 7 years from date of Substantial Completion. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 – PRODUCTS

2.0 MANUFACTURERS

- A. Manufacturers (Tempered Glass): Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:
1. Basis of Design: PPG Industries, Inc.
 - a. Exterior single-pane: Solarbronze®
 - b. ¼" glass
- B. Manufacturers (Insulated Glass Units): Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:
1. Basis of Design: PPG Industries, Inc.
 - a. Exterior Insulating: Solarbronze® with Solarban 60® Solar Control Low-E glass
 - b. 1-inch Units: ¼" glass, ½" airspace

2.02 GLASS

- A. Primary Float Glass: Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedule below.
- B. Heat-Treated Float Glass:
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedule below.
- C. Insulating Glass:
1. Insulating glass is mandatory for exterior applications.
 2. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule. Insulating glass units shall be manufactured by a member of Insulating Glass Certification Council (IGCC) or Sealed Insulating Glass Manufacturing Association (SIGMA).
 3. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
 4. Allowable Tolerances: Maintain minimum glazing tolerance between glass faces and frame or metal stops as recommended by the Flat Glass Marketing Association. For ¼-inch thick glass, maintain 1/8-inch clearance between glass face and metal stops.
 5. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Manufacturer's standard sealants.
 6. Spacer Specifications: Manufacturer's standard spacer material and construction.
 - a. Corner Construction: Manufacturer's standard corner construction.
- D. Coated, Heat Treated Float Glass:
1. General: Provide coated glass complying with requirements indicated in this Article.

- a. Provide Kind FT (fully tempered) products where coated safety glass is indicated.

2.03 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.
- B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

2.04 GLAZING GASKETS

- A. 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.
- B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 1. Neoprene, ASTM C 864.
 2. EPDM, ASTM C 864.
 3. Thermoplastic polyolefin rubber, ASTM C 1115.
 4. Any material indicated above.
- C. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 1. Neoprene.
 2. EPDM.
 3. Thermoplastic polyolefin rubber.
 4. Any material indicated above.

2.09 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 A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.10 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

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. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Maintain minimum glazing tolerance between glass faces and frame or metal stops as recommended by the Flat Glass Marketing Association. For 1/4-inch thick glass, maintain 1/8-inch clearance between glass face and metal stops.
- D. 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.
- E. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

- F. 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.
- G. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- H. Provide spacers for glass lites where the length plus width is larger than 50 inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- I. 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.
- J. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.04 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.05 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.

3.06 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. 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 by glass manufacturer.

3.07 GLAZING TYPES

- A. Exterior Insulating Glass Units:
 - 1. Provide tinted low-E glass
 - 2. Provide kind-FT (fully-tempered) where required.
 - 3. Provide spandrel glass inserts for storefront framing to match insulating glass units.
- B. Interior Glazing:
 - 1. Provide clear float glass, kind FT (fully tempered) where safety glazing is required.

END OF SECTION 08800

SECTION 08830 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Annealed monolithic glass mirrors.

1.2 SUBMITTALS

- A. Product Data: For mirror hardware and mastic.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- C. Samples: For each type of mirror product required, in the form indicated below:
 - 1. Mirrors, 12 inches (300 mm) square, including edge treatment on 2 adjoining edges.
 - 2. Mirror clips.
 - 3. Mirror trim, 12 inches (300 mm) long.
- D. Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.
- E. Mirror Mastic Compatibility Test Reports: From mirror manufacturer.

1.3 QUALITY ASSURANCE

- A. Glazing Publications: Comply with GANA's "Glazing Manual" and GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors" unless more stringent requirements are indicated
- B. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated in second subparagraph below.

1. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRROR MATERIALS

- A. Clear Glass Mirrors: ASTM C 1503, Mirror Glazing Quality.
 1. Nominal Thickness: 6.0 mm.
- B. Annealed Float Glass for Inner Lite of Laminated Mirrors: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; Class 1 (clear).

2.2 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Gunther Mirror Mastics.
 - b. Palmer Products Corporation.

2.3 MIRROR HARDWARE

- A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
 1. Bottom Trim: J-channels formed with front leg and back leg not less than 5/16 and 3/4 inch (7.9 and 19 mm) in height, respectively.
 2. Top Trim: Formed with front leg with a height of 5/16 inch (7.9 mm) and back leg designed to fit into the pocket created by wall-mounted aluminum cleat.
 3. Product: Subject to compliance with requirements, provide the following:
 - a. Bottom Trim: C. R. Laurence Co., Inc.; D638 FHA Type "J" Channel.
 - b. Top Trim: C. R. Laurence Co., Inc.; D 1638 Top Channel.
 - c. Cleat: C. R. Laurence Co., Inc.; D 1637M Mirror Mount System Cleat.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

- C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

- A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.
- B. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Rounded polished edge.
 - 1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
- D. Laminated Safety Mirrors: Provide laminated mirrors fabricated to produce units complying with ASTM C 1172, Kind LM, and the following:
 - 1. Glass Lites: Outer lite of mirror glass with silver coating on second surface and inner lite of clear float glass.
 - 2. Interlayer Material: Mirror manufacturer's standard 0.030-inch- (0.76-mm-) thick, polyvinyl-butylal interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.
 - 3. Laminating Process: Laminate glass using laminator's standard heat-plus-pressure process to produce glass free from foreign substances, air or glass pockets, and other defects.
 - 4. Seal edges of laminated units to comply with written requirements of interlayer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Provide a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. For wall-mounted mirrors, install with mastic and mirror hardware.
 - 1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 2. For mirror hardware in the form of continuous J-channels at bottom, provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, 2 slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long.

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3. For mirror hardware in the form of a continuous J-channel at bottom and continuous top trim at top, fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
 4. Where indicated, install mirror hardware in the form of J-channels that are fabricated in single lengths to fit and cover top and bottom edges of mirrors.
 5. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface.
- D. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- E. Do not permit edges of mirrors to be exposed to standing water.
- F. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08830

SECTION 09111 - INTERIOR NON-LOAD-BEARING STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by a testing and inspection agency.
- B. Sound Transmission Characteristics: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspection agency.
- C. Seismic Standard: Comply with the following:
 - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580 and IBC 1621.2.5.
 - a. Project is located in Seismic Category B.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.

2.2 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. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

- C. 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: As indicated on Drawings.
- D. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges, 3/4 inch (19.1 mm) deep.
 - 2. Steel Studs: ASTM C 645.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.
 - 4. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep members designed to reduce sound transmission.
- E. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
- B. Slip-Type Head Joints: Provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
- E. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
- G. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
- H. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.

- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare-metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

3.2 INSTALLING SUSPENSION SYSTEMS

- A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- B. 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.
 - 3. Do not attach hangers to steel roof deck.
 - 4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 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.
- C. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

- D. 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.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches (150 mm) o.c.
- D. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Z-Furring Members:

1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.

- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 09111

SECTION 09220 - CEMENT STUCCO SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Materials and installation of exterior stucco system
 - 1. Moisture Barrier
 - 2. Stucco Accessories
 - 3. Metal Lath
 - 4. Scratch and Brown Coats
 - 5. Primer
 - 6. Finish Coat

1.2 RELATED SECTIONS

- A. Division 4:
 - 1. Concrete Unit Masonry
- B. Division 6:
 - 1. Exterior Wall Sheathing
- C. Division 7:
 - 1. Elastomeric Sealants
 - 2. Insulation

1.3 REFERENCED DOCUMENTS

- A. ASTM Standards:
 - 1. A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 - 2. A 653 Specification for Sheet Steel Zinc coated (Galvanized) by the Hot-Dip Process, Commercial Quality
 - 3. B 69 Specification for Roller Zinc
 - 4. C 79 Test Method for Gypsum Sheathing Board
 - 5. C 144 Standard Specification for Aggregates Used in Masonry
 - 6. C 578 Specification for Preformed, Cellular Polystyrene Thermal Insulation
 - 7. C 847 Standard Specification for Metal Lath
 - 8. C 897 Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters
 - 9. C 926 Standard Specification for Application of Portland Cement-Based Plaster
 - 10. C 1032 Standard Specification for Woven Wire Plaster Base
 - 11. C 1063 Standard Specification for Installation of Lathing and Furring for Portland Cement Plaster
 - 12. C 1177 Specification for Glass Mat Gypsum for Use as Sheathing
 - 13. D 226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
 - 14. D 1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
 - 15. E 84 Test Method for Surface Burning Characteristics of Building Materials
 - 16. E 119 Method for Fire Tests of Building Construction and Materials.
 - 17. EIMA (EIFS Industry Members Association)
 - 18. EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board

1.4 DESIGN REQUIREMENTS

- A. Moisture Control: Provide corrosion resistant flashing to direct water to the exterior where it is likely to penetrate components in the wall assembly, including, above window and door heads, beneath window and door sills, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, and at the base of the wall.
- B. Air Leakage Prevention: Prevent excess air leakage in the design and detailing of the wall assembly. Provide continuity between air barrier components in the wall assembly.
- C. Vapor Diffusion and Condensation
 1. On framed wall construction provide a code compliant moisture barrier over sheathing. Check the applicable code and code compliance report for the appropriate type.
 2. Protect sills of rough openings with barrier membrane. Where casing bead is used back-to-back at expansion joints, back joints with barrier membrane. Refer to Manufacturer's details.
- D. Grade Condition
 1. Do not apply stucco below grade or on surfaces subject to continuous or intermittent water immersion or hydrostatic pressure. Provide minimum 4 inch clearance above earth grade, minimum 2 inch clearance above finished grade (pavers/sidewalk).
 2. Provide increased clearance in freeze/thaw climate zones.
- E. Joints
 1. Provide two piece expansion joints in the stucco system where building movement is anticipated: at joints in the substrate or supporting construction, where the system is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, at columns and cantilevered areas.
 2. Provide one piece expansion joints every 144 ft².
 3. Cut and wire tie lath to the expansion joint accessory so lath is discontinuous beneath the accessory.
 4. Do not exceed length to width ratio of 2-1/2:1 in expansion joint layout and do not exceed more than 18 feet in any direction without an expansion joint.
 5. Where casing bead is used back-to-back as the expansion joint, back the joint with barrier membrane.
 6. Provide minimum 3/8 inch wide joints where the system abuts windows, doors and other through wall penetrations.
 7. Provide appropriate accessories at stucco terminations and joints
 8. Provide appropriate sealant at stucco terminations.
- F. Solid Substrates
 1. Provide surface plane tolerance not to exceed 1/4 inch in 10 feet.
 2. Concrete—prevent the use of form oil, curing compounds or other bond breakers that inhibit bond to the surface or provide for their removal.
 3. Concrete Masonry—provide open texture concrete masonry units with flush joints.
- G. Stucco Thickness
 1. Direct Application to Concrete or Concrete Masonry: stucco thickness shall not exceed 1/2 inch applied in one or two coats.
 2. Application to Metal Lath: application shall be in two base coats to a thickness of 3/4 inch
 3. Thickness shall be uniform throughout the wall area.

1.5 SUBMITTALS

- A. Manufacturer's specifications, details, installation instructions and product data.
- B. Sample 5-year system warranty.

- C. Installer's proof of certification by product manufacturer, to perform work in accordance with manufacturer's warranty requirements
- D. Samples for approval as directed by architect or owner.

1.6 QUALITY ASSURANCE

- A. Manufacturer requirements
 - 1. Stucco products manufacturer for a minimum of twenty (20) years.
 - 2. Stucco finish products manufactured under ISO 9001:2000 Quality Systems.
- B. Installer requirements
 - 1. Licensed, insured and engaged in application of Portland cement stucco for a minimum of three (3) years.
 - 2. Knowledgeable in the proper use and handling of materials.
 - 3. Employ skilled mechanics who are experienced and knowledgeable in portland cement stucco application, and familiar with the requirements of the specified work
 - 4. Complete Sto Powerwall for the Southwest System Builder's Education Program and Checklist
 - 5. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.
 - 6. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with Manufacturer's published specifications and details and the project plans and specifications.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect coatings (pail products) from freezing and temperatures in excess of 90°F. Store away from direct sunlight.
- C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.8 PROJECT/SITE CONDITIONS

- A. Weather conditions affect application, drying time and curing requirements. Hot or dry conditions limit working time and accelerate drying and may require adjustments in application, scheduling and curing to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing.
- B. Maintain ambient and surface temperatures above 40°F during application and for 24 hours after set of stucco.
- C. Provide supplementary heat for installation in temperatures less than 40°F such that temperatures stated above are maintained. Prevent concentration of heat on uncured stucco and vent fumes and other products of combustion to the outside to prevent contact with stucco.
- D. Prevent uneven or excessive evaporation of moisture from stucco during hot, dry or windy weather. For installation under any of these conditions provide special measures to properly moist cure the stucco (such as misting system).
- E. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.9 COORDINATION/SCHEDULING

- A. Provide minimum 28 day cure of concrete and concrete masonry units before the installation of stucco.
- B. For load bearing concrete masonry and stud wall assemblies, commence the stucco installation after completion of all floor, roof construction and other construction that imposes dead loads on the walls to prevent excessive deflection (and potential cracking) of the stucco.
- C. Sequence interior work such as drywall installation prior to stucco installation to prevent stud distortion (and potential cracking) of the stucco.
- D. Provide site grading such that the stucco terminates above earth grade minimum 4 inches and above finished grade (pavers/sidewalk) minimum 2 inches except at accessible door entries.
- E. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall and provide sill flashing.
 - 1. Coordinate installation of moisture barrier with window and door installation to provide weather proofing of the structure and to prevent moisture infiltration and excess air infiltration. Install window and door head flashing immediately after windows and doors are installed.
 - 2. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.
- F. Install sealants immediately after installation of the stucco and when finish coatings are dry.
- G. Attach penetrations through stucco to structural support and provide water tight seal at penetrations.

1.10 WARRANTY

- A. Provide manufacturer's 5-year system warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Sto Corp.
- B. Provide stucco, primer and finish from single source manufacturer.
- C. Sto Materials have been used as the basis for design. Products by an alternate manufacturer must be approved for substitution per Section 01600, Products Requirements

2.2 MATERIALS

- A. Moisture Barrier - Minimum 2 layers 15 lb/100 ft² vapor permeable asphalt saturated felt in compliance with ASTM D 226 or equal.
- B. Metal lath conforming to requirements of ASTM C 1063.
- C. Mechanical Fasteners and Tie Wire conforming to requirements of ASTM C 1063.
- D. Sto Bonding Agent
 - 1. copolymer bonding agent for brush or roller application to prepared surfaces.
 - 2. copolymer admixture for Sto Powerwall® Scratch and Brown Coat Stucco

- E. Sto Powerwall® Scratch and Brown Coat Polymer Modified Stucco — polymer modified, factory proportioned, fiber reinforced Portland cement based stucco, field mixed with graded sand (ASTM C 897 or C 144), water and Sto Bonding Agent.
- F. Sto Primer—acrylic based tinted primer to provide uniform substrate absorption and finish color, to improve adhesion and water resistance, and to retard efflorescence
- G. Stochastic: Finish Coat, elastomeric smooth wall coating
- H. Water—clean and potable.
- I. Clean, well graded sand free of deleterious materials in compliance with ASTM C 897 or ASTM C 144.

2.3 ACCESSORIES

- A. Weep screed, casing bead, corner bead, corner lath, expansion and control joint accessories. All accessories shall meet the requirements of ASTM C 1063 and its referenced documents:
 - 1. PVC plastic in compliance with ASTM D 1784, cell classification 13244C.
 - 2. Zinc in compliance with ASTM B 69.
 - 3. Galvanized metal in compliance with ASTM A 653 with G60 coating.
 - 4. All accessories shall have perforated or expanded flanges and shall be designed with grounds for the specified thickness of stucco.

2.4 MIXING

- A. Sto Bonding Agent—no mixing required when used as a bonding agent. Shake sealed container before use to a homogeneous consistency.
- B. Sto Powerwall® Scratch and Brown Coat Polymer Modified Stucco
 - 1. Dilute Sto Bonding Agent with 3 parts water to one part Sto Bonding Agent by volume by adding clean, potable water to Sto Bonding Agent in a clean mixing pail and mixing with a high speed electric drill mixer.
 - 2. Follow manufacturer's normal mix ratio and procedures for mixing Sto Powerwall® Scratch and Brown Coat Stucco, except use diluted Sto Bonding Agent in lieu of water.
 - 3. Mix only as much material as can readily be used.
 - 4. Do not use anti-freeze compounds or other additives.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS

- A. Pre-qualify under Quality Assurance requirements of this specification

3.2 EXAMINATION

- A. Inspect surfaces for:
 - 1. Contamination: chalkiness, dirt, dust, efflorescence, form oil, grease, laitance, mildew or other foreign substances.
 - 2. Surface absorption and chalkiness.
 - 3. Cracks: measure crack width and record location of cracks.
 - 4. Damage and deterioration.
 - 5. Moisture damage—record any areas of moisture damage.

6. Report deviations from the requirements of project specifications or other conditions that might adversely affect the stucco installation to the General Contractor.

3.3 GENERAL

- A. Apply the stucco in discrete panels without interruption to avoid cold joints and differences in appearance. Abut wet stucco to set stucco at natural or architectural breaks in the wall such as expansion joints, pilasters, terminations, or changes in plane.
- B. Do not install stucco during extremely hot, dry and/or windy conditions. Hot or dry conditions accelerate drying and moisture loss from stucco which can affect strength and resistance to cracking. Adjustments in the application, scheduling and curing of stucco to prevent rapid loss of moisture are necessary to achieve a satisfactory stucco installation.
- C. Do not install stucco during freezing conditions or on frozen substrates. Cold temperatures retard drying and strength gain and adjustments may have to be made in the application, scheduling and curing of stucco to prevent damage from frost and other trades.
- D. Do not install stucco onto grounds of accessories. Completely embed lath and flanges of accessories and completely cover attachments with stucco.
- E. Moist cure stucco minimum 48 hours for optimum strength gain and resistance to cracking. Allow final stucco application to completely dry before applying primer or finish. The finished installation must be true, plumb and square. Should stucco get into control or expansion joints, remove the stucco from within the joint before the stucco sets.
- F. After satisfactory inspection of surfaces and correction of any deviations from specification requirements commence the stucco installation

3.4 ACCESSORY INSTALLATION

- A. Weep Screed Installation:
 1. Install foundation weep screed at the base of the wall securely to framing with the appropriate fastener.
 2. Locate foundation weep screed so that it overlaps the joint between the foundation and framing by a minimum of 1 inch.
 3. Locate the foundation weep screed minimum 4 inches above earth grade, 2 inches above finished grade at paved surfaces.
- B. Weather Protection:
 1. Protect sills of rough openings with barrier membrane.
 2. Apply moisture barrier in compliance with the applicable building code.
 3. Wrap paper into rough opening and lap over barrier membrane at jambs.
 4. Lap paper over foundation weep screed attachment flange and window/door head flashings.
 5. Refer to Sto Details.
- C. Casing Bead and Expansion Joint Installation:
 1. Install casing beads at stucco terminations—doors, windows and other through wall penetrations.
 2. Install one piece expansion joints at corners of windows, doors, and similar through wall penetrations as shown on the drawings.
 3. Install full accessory pieces where possible and avoid small pieces.
 4. Seal adjoining pieces by embedding ends in sealant.
 5. Abut horizontal into vertical joint accessories.
 6. Attach at no more than 7 inches into framing with appropriate fasteners. Moisture protection must be continuous behind joints and accessories.

- D. Lath Installation
1. General--install metal lath with the long dimension at right angles to structural framing. Terminate lath at expansion joints. Do not install continuously beneath joints.
 2. Seams/Overlaps--overlap side seams minimum 1/2 inch and end seams minimum 1 inch. Stagger end seams. Overlap casing beads and expansion joints minimum 1 inch over narrow wing accessories, minimum 2 inches over expanded flange accessories. Do not install lath continuously beneath expansion joints.
 3. Attachment--fasten securely through sheathing into structural framing at 7 inches on center maximum vertically and 16 inches on center horizontally. Wire tie at no more than 9 inches on center at: side laps, accessory overlaps, and where end laps occur between supports.
- E. One Piece Expansion Joint Installation
1. Install one piece expansion joints over lath at through wall penetrations, for example, above and below doors or windows
 2. Wire tie one piece expansion joints to lath at no more than 7 inches on center. Make certain lath is discontinuous beneath joints.
- F. Inside and Outside Corners
1. Install corner lath at inside corners and corner bead at outside corners over lath. Attach through lath into framing at no more than 7 inches on center with appropriate fasteners.

3.5 STUCCO INSTALLATION

- A. Scratch Coat:
1. Apply stucco with sufficient pressure to key into and embed the metal lath.
 2. Apply sufficient material, 3/8—1/2 inch, to cover the metal lath and to permit scoring the surface.
 3. Score the stucco upon completion of each panel in preparation for a second coat. Score horizontally.
- B. Brown Coat:
1. As soon as the first coat is firm enough to receive the second coat without damage, apply the second coat.
 2. Alternatively, moist cure the first coat up to 48 hours and dampen the scratched surface with water immediately before applying the second coat.
 3. Apply the second coat with sufficient pressure to ensure intimate contact with the first coat and as needed to bring the stucco to a uniform thickness that matches the grounds of the accessories.
 4. Use a rod or straight edge to bring the surface to a true, even plane. Fill depressions in plane with stucco. Final thickness of stucco shall be minimum 3/4 inch, maximum 7/8 inch
 5. After the stucco has become slightly firm float the surface lightly with a darby or wood float to densify the surface and to provide a smooth, even surface.
- C. Moist curing
1. Lightly fog for at least 48 hours after the stucco has slightly set
 2. Fog as frequently as required during the 48 hour period to prevent loss of moisture from the stucco.
 3. Avoid eroding the stucco surface with excess moisture.
 4. If relative humidity exceeds 75% the frequency of moist curing can be diminished.
- D. Primer Installation
1. Apply primer evenly with brush, roller or proper spray equipment over the clean, dry stucco and allow to dry thoroughly before applying finish.
- E. Finish Installation
1. Apply finish directly over the stucco when dry.
 2. Apply finish by troweling to a smooth finish with a stainless steel trowel. Follow these general rules for application of finish:

- a. Allow primed stucco wall surface to dry minimum 28 days.
 - b. Avoid application in direct sunlight.
 - c. Apply finish in a continuous application, and work a wet edge towards the unfinished wall area.
 - d. Work to an architectural break in the wall before stopping to avoid cold joints.
3. Weather conditions affect application and drying time.
- a. Hot or dry conditions limit working time and accelerate drying.
 - b. Adjustments in the scheduling of work may be required to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing.
 - c. Adjust work schedule and provide protection.
4. Do not install separate batches of finish side-by-side.
5. Do not apply finish into or over joints or accessories. Apply finish to outside face of wall only.
6. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.

3.6 PROTECTION

- A. Provide protection of installed materials from water infiltration into or behind them.
- B. Provide protection of installed stucco from dust, dirt, precipitation, and freezing.
- C. Provide protection of installed primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.

END OF SECTION 09220

SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board for wall and ceiling systems.
 - 2. Tile backing panels.

1.2 RELATED SECTIONS

- A. See the following sections for related system information.
 - 1. Section 05400 Cold-Formed Metal Framing
 - 2. Section 09111 Interior Non-Load-Bearing Metal Framing.
 - 3. Section 09310 Tiling
 - 4. Section 09511 Acoustical Panel Ceilings for edge banding of suspended gypsum board ceilings.
 - 5. Section 06160 Sheathing for exterior wall and soffit board materials and installation.

1.3 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.

1.4 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.
- C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. 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. Project Standard:
1. Core: 5/8 inch, Type X:
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Moisture and Mold-Resistant at plumbing walls
1. Core: 5/8 inch, Type X.
 2. Long Edges: Tapered.
- D. Tile Backer Board: ASTM C1178 glass mat gypsum substrate for use as tile backer and approved for use by the Tile Council of America (TCA) Handbook for Ceramic Tile Installation
1. Product: Georgia-Pacific Corporation DensShield Fireguard Type X
 2. Composition: 5/8 inch, Water-resistant treated core with glass mat moisture protectant coating and embedded glass mats, both sides. Face side surfaced with heat-cured copolymer water.
 3. Fire Resistance when tested in accordance with ASTM E119, UL Classified.
 4. Provide 2 inch wide, coated glass fiber tape for joints and corners

2.2 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. 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: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.3 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Paper.
 2. Tile Backing Panels: As recommended by panel manufacturer.
- 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, rounded or beveled panel edges, 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 or drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

2.4 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.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."
- E. Insulation: As specified in Division 7 Section "Building Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. 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.
- D. 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.

3.2 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces, unless otherwise indicated.
 - 2. Type C: Where required for specific fire-resistance-rated assembly indicated.
 - 3. Flexible Type: Apply in double layer at curved assemblies.
 - 4. Ceiling Type: As indicated on Drawings.
 - 5. Foil-Backed Type: As indicated on Drawings.
 - 6. Abuse-Resistant Type: As indicated on Drawings.
 - 7. High-Impact Type: As indicated on Drawings.
 - 8. Moisture- and Mold-Resistant Type: As indicated on Drawings.

3.3 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, unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated.
 - 4. U-Bead: Use at exposed panel edges.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.4 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, rounded or beveled edges, 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: Panels that are substrate for tile.
 - 3. Level 3: Where indicated on Drawings.
 - 4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - 5. Level 5: Where indicated on Drawings.

3.5 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 matching approved mockup and] free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.6 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 09250

SECTION 09310 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, tools, equipment and services necessary for and reasonably incidental to complete the tile work as shown on the drawings or specified.
- B. Tile includes:
 - 1. Porcelain floor and wall tile.
 - 2. Bullnose trim units to match tile
- C. Related Sections
 - 1. Division 7 Section Sealants
 - 2. Division 7 Section Waterproofing for waterproof membrane over concrete flooring to receive tile

1.2 SUBMITTALS

- A. Product Data: Tile, mortar, grout, and other products specified.
- B. Samples for Verification: Of each item listed below, submit Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- C. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

1.3 REFERENCE STANDARDS

- A. Comply with current editions and applicable Specifications of the following:
 - 1. American Society for Testing and Materials (ASTM).
 - 2. American National Standards Institute (ANSI).
 - 3. Tile Council of America (TCA) Handbook for Ceramic Tile Installation.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers and Products:
 - 1. Tile Products: See Architect's Finish Legend.
 - 2. Tile-Setting Materials: As indicated below.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
 - 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles
- C. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

- A. PERFORMANCE REQUIREMENTS
 - 1. Breaking Strength >250 lbf. ASTM C648
 - 2. Bond Strength >200 psi ASTM C482
 - 3. Chemical Resistance Unaffected ASTM C650
 - 4. Frost Resistance Resistant ASTM C1026
 - 5. Water Absorption < 0.10% ASTM C373
 - 6. Scratch Hardness 6 MOH's Scale
 - 7. COF- Dry > 0.8 ASTM C1028-89
 - 8. COF- Wet > 0.6 ASTM C1028-89
- B. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
 - 1. Shapes: As indicated on the Drawings.
 - a. Base: Bullnose and Bullnose corner.

- b. Provide marble threshold trim strips or other edging material where tile terminates at dissimilar finishes as shown or specified.

2.4 SETTING AND GROUTING MATERIALS

- A. Use appropriate installation mortars according to ANSI A118-1999 series or A136.1-1999.
- B. Use grout per ANSI A118.3, A118.5, A118.6 A118.7 or A118.8-1999.
- C. Use waterproofing/Anti Fracture Membrane as required according to ANSI A118.10-1999.

2.5 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

2.7 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
 - 1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:
 - 1. Petroleum paraffin wax or grout release.

3.3 INSTALLATION, GENERAL

- A. Install tile in pattern indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Adjust to minimize tile cutting and to avoid tile less than half size.
- B. When possible, smooth cut edges of tile and/or use appropriate cutter or wet saw to produce smooth cuts. Provide straight cuts which align with adjacent materials.
- C. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption.
- D. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.
- E. Provide tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints smooth and even, without voids, cracks, or excess mortar or grout.
- F. Mix mortar in strict accordance with manufacturer's recommendations.
- G. Apply setting material in accordance with manufacturer's directions and install tile before mortar has started initial cure. For thin set mortar application, use a notch trowel that will achieve the recommended coverage of mortar after tiles have been installed. Reference standard coverage information and follow manufacturer's recommendations for trowel size when using mortar.
- H. Do not spread more material than can be covered within 10 to 15 minutes. If "skinning" occurs, remove mortar and spread fresh material. Spread mortar with notches running in one direction that shall be perpendicular to the pressing, pushing and pulling of tile during placement.

- I. Place tile in fresh mortar, press, push and pull the tile slightly to achieve as near 100% coverage and contact of tile with setting material and substrate as possible. The coverage shall be no less than 85% and be sufficiently distributed to give full support of the tile. Make sure that all corners and edges are well supported with mortar. Leave no hollow corners or edges. NOTE: 95-100% coverage is mandatory for wet or exterior areas. A skim coat ("back-butter") of mortar can be placed onto the entire back of the tile using a trowel in order to assist in optimum adhesion and coverage of the mortar being used.
- J. Ensure there is a minimum 1/8" of mortar between tile and substrate after proper bedding. Installer must periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications. If coverage is found to be insufficient, use a larger size notch trowel.
- K. Use a beating block and hammer or rubber mallet so that faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.

3.4 GROUTING:

- A. Install grout as scheduled, correlating to grout type chosen and manufacturer's recommendations.
- B. Mix grout material in strict accordance with manufacturer's directions.
- C. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps.
- D. Before grouting entire area do a test area to assure there will be no permanent staining or discoloration of the tile and to verify that the grout is easily removed from the surface. If necessary, pre-coat exposed surfaces of tile with a grout release as recommended by the manufacturer, as this will facilitate removal of the grout.
- E. Cure all setting and grouting materials in accordance with manufacturer's recommendations.

3.5 CLEANING AND PROTECTING

- A. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter, in accordance with manufacturer's instructions. If a grout haze or residue remains, use a suitable grout haze remover or cleaner and contact grout manufacturer for recommendations. Flush surface with clean water before and after cleaning. Do not use harsh hydrochloric, muriatic or sulfuric acid or acid-based cleaners to clean glazed tiles or tiles grouted with latex modified grout.
- B. When a heavy residue of Portland cement grout is present, acceptable tile cleaning acids may be used. However, the grout should be allowed to cure a minimum of 10 days before this aggressive cleaning method is employed. Tile and grout shall be soaked with water before cleaning. In the absence of a recommendation from the grout manufacturer, acid cleaning may be done with a saturated solution of phosphoric or sulfamic acid, mixed in accordance with manufacturer's recommendations.
- C. After cleaning, provide protective covering and maintain conditions to protect tile work from damage or deterioration. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, and during move-in of furniture and equipment, cover protective covering with 1/4" hardboard, plywood or similar material.
- D. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

3.6 FLOOR AND WALL TILE INSTALLATION SCHEDULE

- A. Floor Tile Installation Method: Thin-Set Method ANSI A108.5
 - 1. TCA F122 over waterproof membrane over concrete subfloor
 - 2. Waterproofing, see Division 7 Section, ANSI A118.10
 - 3. Setting Bed: Sanded or Unsanded Latex-Portland Cement Mortar, ANSI A118.4
 - 4. Grout -ANSI A118.7, Polymer Modified

- B. Wall Tile Installation Method: Thin-Set Method ANSI A108.5
 - 1. TCA W202 over dimensionally stable masonry or concrete
 - 2. TCA W-244 over dry, well braced metal studs sheathed with tile backer board; thin-set method
 - 3. Setting Bed: Sanded or Unsanded Latex-Portland Cement Mortar, ANSI A118.4
 - 4. Grout -ANSI A118.7, Polymer Modified

END OF SECTION 09310

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
- B. Acoustical panels and exposed suspension systems for ceilings.
- C. Edge treatment of suspended gypsum board ceiling systems.

1.2 RELATED SECTIONS

- A. See Section 09111 for attachment of suspended gypsum board ceiling systems.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Drawn to scale and coordinating acoustical panel ceiling installation with hanger attachment to building structure and ceiling mounted items:
- C. Samples: For each exposed finish.
- D. Product test reports.
- E. Research/evaluation reports.
- F. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.
- B. Fire-Test-Response Characteristics:
 - 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. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.
 - a. Smoke-Developed Index: 450 or less.
- C. Seismic Standard: Comply with the following:
 - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580 and IBC 1621.2.5.
 - a. Project is located in Seismic Category B.

1.5 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.
- B. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Acoustical Panel Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
 - 1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 1. 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 0.106-inch- (2.69-mm-) diameter wire.
- E. 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.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Basis-of-Design Manufacturer: Armstrong, Inc.
- B. Other available manufacturers:
 - 1. BPB USA.
- C. Chicago Metallic Corporation.
- D. Ecophon CertainTeed, Inc.
- E. Tectum Inc.
- F. USG Interiors, Inc.
- G. Color: As selected from manufacturer's full range.

- H. Edge/Joint Detail: Architect to select edge detail selected from selected manufacturer's standard range.
- I. Thickness: 5/8 inch (15 mm), minimum.
- J. Modular Size: Per Architect, but no less than 24 by 24 inches (610 by 610 mm).

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Basis-of-Design Manufacturer: Armstrong, Inc.
- B. Other available manufacturers:
 - 1. Armstrong World Industries, Inc.
- C. BPB USA.
- D. Chicago Metallic Corporation.
- E. Ecophon CertainTeed, Inc.
- F. Tectum Inc.
- G. USG Interiors, Inc.
- H. 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 9/16-inch- (15-mm-) wide metal caps on flanges.
 - 1. Structural Classification: Intermediate-duty system.
- I. End Condition of Cross Runners: Override (stepped) or butt-edge type.
- J. Cap Material: Aluminum cold-rolled sheet.
- K. Cap Finish: Painted in color as selected from manufacturer's standard range.

2.4 CUSTOM PERIMETER TRIM

- A. Product/Manufacturer: Axiom-Classic Custom Perimeter Trim; Armstrong World Industries, Inc.
- B. Components: Edge trim system for suspended ceiling system, extruded aluminum alloy 6063 trim channel, 10' straight or curved profiles to minimum 24" inside and outside radii for acoustical and for drywall applications; plus factory-finished corners with 12" legs. Attachment to grid system is provided by the specially designed tee-bar connection clips or hanging clips, which lock into specially designed bosses on the trim channel and are screw-attached to the web of the intersecting suspension system members. Sections of trim are joined together using a splice plate. Gypsum board interface, below the trim channel, is accomplished with the Bottom Drywall Trim.
 - 1. Trim Channel: wide face with 3/4" horizontal legs, straight or curved sections with special bosses formed for attachment to the tee-bar connection clip or hanging clip; commercial quality, extruded aluminum, factory-finished in factory-applied baked polyester paint to match grid color
 - 2. Splice Plate: Galvanized steel finish; formed to fit into special bosses and locked in place with factory-installed screws. .

3. Tee-Bar Connection Clip: Galvanized steel, finish to match trim, channel formed to fit into special bosses and locked in place by factory-installed screws and attached to Drywall Furring System or suspension system members.
4. Hanging Clip: Commercial quality aluminum, finish to match trim channel, formed to lock into special bosses and attach to Drywall Furring System or suspension system members.
5. Drywall Bottom Trim: Commercial quality extruded aluminum straight or curved sections finished with chemical conversion coating and formed to match the trim channel profile and to provide integrated taping flange for integrated 5/8" drywall finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders.
- C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. 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.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. 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.
- 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.

END OF SECTION 09511

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Resilient wall base.
 - 2. Resilient flooring accessories.
 - 3. Resilient carpet accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples for Selection: Manufacturer's standard sample sets consisting of sections of units showing the full range of colors and patterns available for each type of product indicated.
- C. Samples for Verification: In manufacturer's standard sizes, but not less than 12 inches (300 mm) long, of each product color and pattern specified.
- D. Product Certificates: Signed by manufacturers of resilient wall base and accessories certifying that each product furnished complies with requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.
- B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
 - 2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).
- C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

- A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive resilient products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- B. Do not install products until they are at the same temperature as the space where they are to be installed.
- C. For resilient products installed on traffic surfaces, close spaces to traffic during installation and for time period after installation recommended in writing by manufacturer.
- D. Coordinate resilient product installation with other construction to minimize possibility of damage and soiling during remainder of construction period. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each different type, color, pattern, and size of resilient product installed.
 - 2. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Resilient Wall Base and Accessory Schedule at the end of Part 3.

2.2 RESILIENT WALL BASE

- A. Rubber Wall Base: Products complying with FS SS-W-40, Type I and with requirements specified in the Resilient Wall Base and Accessory Schedule.

2.4 RESILIENT ACCESSORIES

- A. Rubber Accessories: Products complying with requirements specified in the Resilient Wall Base and Accessory Schedule.

2.5 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements, including those for maximum moisture content. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- D. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- E. Broom and vacuum clean substrates to be covered immediately before installing resilient products. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Install resilient products according to manufacturer's written installation instructions.
- B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
 - 1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
 - 2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 3. Do not stretch base during installation.
 - 4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - 5. Form outside corners on job, from straight pieces of maximum lengths possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
 - 6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.
- C. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing resilient products:

1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
 2. Sweep or vacuum horizontal surfaces thoroughly.
 3. Do not wash resilient products until after time period recommended by resilient product manufacturer.
 4. Damp-mop or sponge resilient products to remove marks and soil.
- B. Protect resilient products against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by resilient product manufacturer.
- C. Clean resilient products not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.
- 3.5 RESILIENT WALL BASE AND ACCESSORY SCHEDULE
- A. Rubber Wall Base:
1. Products: See Finish Schedule on Drawings.
 2. Style: Cove with top-set toe for linoleum tile and straight with no toe for carpet.
 3. Minimum Thickness: 1/8 inch (3.2 mm).
 4. Height: 4 inches (101.6 mm).
 5. Lengths: Coils in lengths standard with manufacturer, but not less than 96 feet (29.26 m).
 6. Outside Corners: Job formed.
 7. Inside Corners: Job formed.
 8. Ends: Premolded.
 9. Surface: Smooth.

END OF SECTION 09653

SECTION 09654 - LINOLEUM FLOOR COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Linoleum sheet flooring.

1.2 RELATED SECTIONS

- A. See Section 09651 for wall base associated with linoleum floor tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- C. Samples: In manufacturer's standard size, but not less than 6-by-9-inch (152-by-230-mm) sections of each color and pattern of floor covering required.
- D. Maintenance data.

1.4 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.

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor coverings.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 72 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Armstrong World Industries, Inc.
1. Product Line: Marmorette®
 2. Color/Pattern: Architect to select from manufacturer range.

2.2 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 products and substrate conditions indicated.
1. Use adhesives that have a VOC content of not more than [50 g/L] <Insert requirement> when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Integral-Flash-Cove-Base Accessories:
1. Cove Strip: 1-inch (25.4-mm) radius provided or approved by manufacturer.
 2. Cove-Base Cap Strip: provided or approved by manufacturer.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- B. Concrete Substrates: 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 floor covering 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. Proceed with installation only after substrates pass testing.
- 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 coverings until they are same temperature as space where they are to be installed.
1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.
- E. Adhere floor coverings to 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.

3.3 LINOLEUM FLOOR TILE INSTALLATION

- A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor 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.
- B. Match floor tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

3.4 LINOLEUM SHEET FLOORING INSTALLATION

- A. Unroll sheet floorings and allow them to stabilize before cutting and fitting.
- B. Lay out sheet floorings as follows:
 - 1. Maintain uniformity of floor covering direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor covering substrates.
 - 3. Match edges of floor coverings for color shading at seams.
 - 4. Avoid cross seams.
 - 5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).
- C. Integral-Flash-Cove Base: Cove linoleum floor covering 6 inches (152 mm) up vertical surfaces. Support floor covering at horizontal and vertical junction with cove strip. Butt at top against cap strip.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor coverings before applying liquid floor polish.

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1. Apply three coat(s).
- C. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover floor coverings until Substantial Completion.

END OF SECTION 09654

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes commercial carpet for direct glue-down application in locations indicated on Drawings with seam locations indicated on Shop Drawings.

1.2 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:
1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 2. Carpet Cushion: For each type indicated. Include manufacturer's written data on physical characteristics and durability.
- B. Shop Drawings: Show the following:
1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 2. Carpet type, color, and dye lot.
 3. Locations where dye lot changes occur.
 4. Seam locations, types, and methods.
 5. Type of subfloor.
 6. Type of installation.
 7. Pattern type, repeat size, location, direction, and starting point.
 8. Pile direction.
 9. Type, color, and location of edge, transition, and other accessory strips.
 10. Transition details to other flooring materials.
 11. Type of carpet cushion.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet: 12-inch- (300-mm-) square Sample.
 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- (300-mm-) long Samples.
 3. Carpet Cushion: 6-inch- (150-mm-) square Sample.
 4. Carpet Seam: 6-inch (150-mm) Sample.
- D. Product Schedule: For carpet and carpet cushion. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- G. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

2. Precautions for cleaning materials and methods that could be detrimental to carpet and carpet cushion.

H. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Mockups: Before installing carpet, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.5 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet and carpet cushion until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet and carpet cushion over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.6 WARRANTY

- A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, and delamination.
 3. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Warranty for Carpet Cushion: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.
 1. Warranty includes consequent removal and replacement of carpet and accessories.

2. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse.
3. Failure includes, but is not limited to, permanent indentation or compression.
4. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET

A. Basis of Design Manufacturer: Mohawk

1. Product: to be selected from "Collection" products.
 - a. Pattern: Medium-Scale; to be selected from "Collection".
 - b. Color: selected by Architect.

B. See Architect's Finish Legend for full manufacturer and selection information.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet cushion manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.
- C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet cushion manufacturer.
 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- 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 cushion manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. Comply with CRI 104 and carpet and carpet cushion manufacturers' written installation instructions for the following:
 - 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
- B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet 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 manufacturer.
- E. Extend carpet 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. Comply with carpet cushion manufacturer's written recommendations. Install carpet cushion seams at 90-degree angle with carpet seams.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."

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- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet cushion and adhesive manufacturers.

END OF SECTION 09680

SECTION 09900 – PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes
 - 1. Surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 2. Surface preparation and field application of high performance coatings
 - 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

- B. Finish exposed surfaces, except where the finish schedules indicate that a surface or material is not to be painted/coated or is to remain natural. If the finish schedules do not specifically mention an item or a surface, paint/coat the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1. Painting and coating includes field application of paint/coat to exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

- C. Do not paint/coat prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. 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.
 - 2. Labels: Do not paint/coat over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.2 DEFINITIONS

- A. General: The standard procedure for measuring specular gloss is contained in ASTM D 523.
 - 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 5 and 20 when measured at a 60-degree meter.
 - 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 - 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.3 SUBMITTALS

- A. Product Data: For each painting/coating system specified. Include block fillers and primers.
 - 1. Material List: Provide 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: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
- B. Samples for Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
1. After color selection, the Architect will furnish color chips for surfaces to be coated.
- C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
 3. Submit Samples on the following substrates for the Architect's review of color and texture only:
 - a. Concrete: Provide two 4-inch- (100-mm-) square samples for each color and finish.
 - b. Concrete Masonry: Provide two 4-by-8-inch (100-by-200-mm) samples of masonry, with mortar joint in the center, for each finish and color.
 - c. Painted Wood: Provide two 12-inch- (300-mm-) square samples of each color and material on hardboard.
 - d. Stained or Natural Wood: Provide two 4-by-8-inch (100-by-200-mm) samples of natural- or stained-wood finish on actual wood surfaces.
 - e. Ferrous Metal: Provide two 4-inch- (100-mm-) square samples of flat metal and two 8-inch- (200-mm-) long samples of solid metal for each color and finish.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
1. Field Quality Control:
 2. Review of first finished room, space, or item of each color scheme is required by Architect for color, texture, and workmanship.
 3. Use first acceptable room, space or item as Project standard for each color scheme.
 4. For spray application, paint surface not smaller than 100 square feet as Project standard.
 5. Secondary products not specified by name and required for the job such as shellac shall be "best grade" or "first line" products.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.

6. Application instructions.
7. Color name and number.
8. VOC content.

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage 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. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 PROJECT CONDITIONS

- A. Apply water-based paints/coatings only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).
- C. Do not apply paint/coating in snow, rain, fog, or mist; or when the 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/coating may continue during inclement weather if surfaces and areas to be finished are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.7 EXTRA MATERIALS

- A. Furnish Owner clean, new, one-quart cans of paints and coatings used on the Project, well marked, indicating location of each color and type material used. One can if less than 1,000 square feet, two cans if over 1,000 square feet covered.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Provide one of the products in the paint/coating schedules.
- B. Manufacturers Names: The following manufacturers are referred to in the schedules by use of shortened versions of their names, which are shown in parentheses:
1. Benjamin Moore & Company (Moore)..
 2. Kwal•Howells, Inc (K•H).
 3. The Sherwin-Williams Company (S-W).
 4. Tnemec Company, Inc. (Tnemec).
 5. Materials selected for coating systems for each type of surface shall be the product of a single manufacturer.

2.2 MATERIALS

- A. Quality: Provide the best quality grade of the various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Paint material containers not displaying manufacturer's product identification will not be acceptable.

- B. No claim as to the unsuitability or unavailability of any material specified, or unwillingness to use specified products, or inability to produce first-class work with specified products, will be entertained.
- C. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- D. Material Quality: Provide the manufacturer's best-quality trade sales paint/coating material of the various coating types specified. Material containers not displaying manufacturer's product identification will not be acceptable.
- E. Colors:
 - 1. Provide custom colors of the finished systems to match the Architect's samples.
 - 2. Match colors indicated by reference to the manufacturer's standard color designations.
 - 3. Provide color selections made by the Architect from the manufacturer's full range of standard colors.

2.3 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. Provide products of same manufacturer for each coat in a coating system.
- B. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
 - 1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
 - 2. Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
 - 3. Anticorrosive Coatings: VOC content of not more than 250 g/L.
 - 4. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing 1 or more benzene rings).
 - 5. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.

- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting/coating will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting/coating will be construed as the 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 the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting/coating 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 the substrates of substances that could impair the 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/coated 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 masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - 3. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - 4. 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 where moisture content exceeds that permitted in manufacturer's written instructions.
 - 5. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 - 6. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

7. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 8. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 9. When transparent finish is required, backprime with spar varnish.
 10. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 11. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 12. 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 the Steel Structures Painting Council's (SSPC) recommendations.
 13. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
 14. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 15. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
 16. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials 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 the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the 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, convactor covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on 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 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, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the 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 the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Piping, pipe hangers, and supports.
 2. Heat exchangers.
 3. Tanks.
 4. Ductwork.
 5. Insulation.
 6. Motors and mechanical equipment.
 7. Accessory items.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Conduit and fittings.
 2. Switchgear.
 3. Panelboards.
- 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 of material, as recommended by the 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. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats unless indicated otherwise.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 PAINTING SCHEDULE

- 1. The following schedule for finishing is not intended to mention every particular item which will receive painter's finish. The kinds of paint and number of coats required on the various surfaces shall be as scheduled.

3.7 EXTERIOR PAINT SYSTEMS

- A. Wood Stains For Exterior:
 - 1. Semitransparent Oil/Alkyd Stain: Factory-formulated oil- or oil/alkyd-resin-based semitransparent wood stain applied at spreading rate recommended by manufacturer.
- B. Ferrous Metal: Shop primer must be compatible with paint systems specified below:
 - 1. Paint System -: Two finish coats over primer.
 - a. Primer: Synthetic rust-inhibiting primer.
 - 1) K•H: 9210 Rust Inhibiting Metal Primer
 - 2) Moore: Alkyd Metal Primer M06.
 - 3) S-W: Kem Kromik Metal Primer B50N2/B50W1.
 - b. First and Second Coats: Acrylic Latex.
 - 1) K•H: 3200 Acrylic Latex Semi-Gloss
 - 2) Moore: Moorcraft Super Spec Latex House & Trim #170.
 - 2. S-W: A-100 Latex House and Trim Paint A82 Series.

- C. Galvanized Metal:
 - 1. Paint System - Acrylic Latex: Two finish coats over primer.
 - a. Primer: Galvanized metal primer.
 - 1) K•H: 5800 100% Acrylic Primer.
 - 2) Moore: Fresh Start #023
 - 3) S-W: DTM Primer Finish B66W1.
 - b. First and Second Coats: Acrylic Enamel.
 - 1) K•H: 3200 Acrylic Latex Semi-Gloss.
 - 2) Moore: Moorcraft Super Spec Latex House & Trim #170.
 - 3) S-W: A-100 Latex House and Trim Paint A82 Series.

3.8 INTERIOR PAINTING AND COATING SYSTEMS

- A. Concrete Floor Sealer
 - 1. First Coat: Tnemec Series 201 Epoxoprime, polyamine epoxy, 6.0 to 12.0 mils DFT.
- B. Concrete Masonry (Cmu)
 - 1. First Coat: Tnemec Series 54-660 Masonry Filler
 - 2. Second Coat: Tnemec Series 83 Ceramlon II, modified aliphatic amine epoxy, 3.0 to 8.0 mils DFT
 - 3. Third Coat: Tnemec Series 83 Ceramlon II, modified aliphatic amine epoxy, 3.0 to 8.0 mils DFT
- C. Ferrous Metals
 - 1. Surface Prep: SSPC-SP-6 "Commercial Blast Cleaning" (no shop primer)
 - a. Bar joists must be commercial blast cleaned before Tnemec primer is applied.
 - b. Top surface of bar joists and steel shall be primed before metal decking is installed.
 - c. Steel may be primed in the shop if SP-6 surface preparation and Tnemec "90-97" primer is used.
 - 2. First Coat: Tnemec Zinc-rich Organic Primer, Series 90-97 "Tneme-Zinc"
 - 3. Second Coat: Tnemec Polyamidoamine Epoxy, Series 66 "Hi-Build Epoxoline," 2.0 to 6.0 mils DFT
 - 4. Third Coat: Tnemec Acrylic Polyurethane, aliphatic finish coat, Series 73 "Endura Shield", 2.0 to 5.0 mils DFT.
- D. Non-Ferrous Metals
 - 1. First Coat: Tnemec Polyamidoamine Epoxy, Series 66 "Hi-Build Epoxoline," 2.0 to 6.0 mils DFT
 - 2. Second Coat: Tnemec Acrylic Polyurethane, aliphatic finish coat, Series 73 "Endura Shield", 2.0 to 5.0 mils DFT.
- E. WOOD, VARNISHED: Wood Trim And Millwork
 - 1. First Coat: Polyurethane varnish, satin
 - 2. Second Coat: Polyurethane varnish, satin
 - 3. Lightly sand between varnish coats
- F. Gypsum Wallboard
 - 1. First Coat: Tnemec Series 51-792 PVA Sealer, waterborne vinyl acrylic sealer, 1.0 to 2.0 mils DFT
 - 2. Second Coat: Tnemec Series 114 H.B. Tneme-Tufcoat, chemical-resistant waterborne acrylic epoxy, 4.0 to 6.0 mils DFT
 - 3. Third Coat: Tnemec Series 114 H.B. Tneme-Tufcoat, chemical-resistant waterborne acrylic epoxy, 4.0 to 6.0 mils DFT

END OF SECTION 09900

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes toilet compartments and screens as follows:
 - 1. Type: Powder-coated steel.
 - 2. Compartment Style: Floor anchored.
 - 3. Screen Style: Wall hung.

1.2 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Verification: Of each compartment or screen color and finish required, prepared on 6-inch-(150-mm-) square Samples of same thickness and material indicated for Work.

1.3 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Capitol Partitions, Inc.
 - 2. General Partitions Mfg. Corp.
 - 3. Global Steel Products Corp.
 - 4. Hadrian Inc.
 - 5. Knickerbocker Partition Corporation.
 - 6. Metpar Corp.
 - 7. Santana Products, Inc.
 - 8. Young Sales Corp.; DesignRite.

2.2 MATERIALS

- A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.
- B. Powder-coated steel Units: Facing sheets and closures fabricated from ASTM A 591/A 591M, (electrolytically zinc-coated) or ASTM A 653/A 653M (hot-dip galvanized or galvanized), commercial steel sheet for exposed applications, that is mill phosphatized, and selected for smoothness.
1. Finish: Manufacturer's standard pigmented, organic coating.
 - a. Color: One color in each room as selected by Architect from manufacturer's full range of colors.
 2. Pilasters (Braced): 0.0500 inch (1.3 mm).
 3. Panels and Screens: 0.0312 inch (0.8 mm).
 4. Doors: 0.0312 inch (0.8 mm).
 5. Tapping Reinforcement: 0.0781 inch (2.0 mm).
- C. Core Material for Metal-Faced Units: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) minimum for doors, panels, and screens and 1-1/4 inches (32 mm) minimum for pilasters.
- D. Pilaster Shoes and Sleeves (Caps): Powder-coated steel, not less than 0.0312 inch (0.8 mm) thick and 3 inches (75 mm) high, finished to match hardware.
- E. Stirrup Brackets: Manufacturer's standard ear or U-brackets for attaching panels and screens to walls and pilasters of the following material:
1. Material: Powder-coated steel.
- F. Full-Height (Continuous) Brackets for Urinal Screens: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:
1. Material: Powder-coated steel.
- G. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
1. Material: Powder-coated steel.
- H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide hex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

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1. Provide internal reinforcement in metal units for compartment-mounted hardware, accessories, and grab bars, as indicated.
- B. Metal-Faced Toilet Compartments and Screens: Pressure laminate seamless face sheets to core material and provide continuous, interlocking molding strip or lapped and formed edges. Seal corners by welding or clips. Grind exposed welds smooth.
- C. Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.
 1. Provide V-shaped, metal-faced screens with manufacturer's standard sound-deadening core material bonded to inner surface of face sheets. Provide metal top and bottom caps. Fabricate screens to form unit that is a maximum of 6 inches (150 mm) wide at wall and 1 inch (25 mm) wide at its protruding end. Provide complete with concealed anchoring devices for attachment to wall and mechanical leveling adjustment.
- E. Floor-Anchored Screens: Provide pilasters and panels of same construction and finish as toilet compartments. Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- F. Doors: Provide custom wood doors as specified in Division 8 Section "Flush Wood Doors":
 1. Hinges: Manufacturer's self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
 2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
 3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
 5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

2.4 SHEET STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.
- B. Floor-Anchored Compartments: Set pilaster units with anchors penetrating not less than 2 inches (50 mm) into structural floor, unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- C. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

SECTION 10500 - SOLID PLASTIC LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes solid plastic athletic lockers as indicated on Drawings.
- B. See Drawings for required accessibility standards. Provide lockers to meet these standards and as outlined below.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Show locker fillers, trim, base, sloping tops, and accessories. Include locker-numbering sequence.
- C. Samples for Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.
- B. Protect lockers from damage during delivery, handling, storage, and installation.
- C. Deliver master keys, control keys, and combination control charts to Owner.

1.5 WARRANTY

1.6

- A. Provide manufacturer's twenty year warranty against rust, delamination or breakage of plastic components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Lenox Lockers manufactured by The Mills Company, a subsidiary of Bradley Corporation, P.O. Box 309, Menomonee Falls, WI 53052-0309. Phone 800-BRADLEY (800-272-3539), FAX 262-251-5817. <http://www.bradleycorp.com>

2.2 MATERIALS

- A. HDPE plastic sheet, standards per manufacturer.

2.3 COMPONENTS

- A. Locker material: Sides, backs, shelves, tops, bottoms, doors, door frames and continuous latch constructed from high-density polyethylene (HDPE).
 1. Sides, shelves, tops, bottoms and backs fabricated from 3/8 inch (10 mm) HDPE.
 2. Doors, door frames and continuous latch fabricated from 1/2 inch (13 mm) HDPE.
 3. Slope tops fabricated from 1/2 inch (13 mm) HDPE sheets, and 1 inch (25.4 mm) HDPE back plates.
 4. Bases fabricated from 1 inch (25.4 mm) HDPE.
 5. End panels fabricated from 3/8 inch (10 mm) HDPE.
 6. Door hinge: Continuous piano hinge

2.4 HARDWARE AND ACCESSORIES

- A. Provide one plastic double coat hook for each opening in one and two tier lockers.
- B. Provide one number plate for each opening.
- C. Provide screws, anchors and angle brackets for locker base installation.
- D. Provide hardware for attaching bench top to pedestals and anchoring pedestals to floor.

2.5 FABRICATION

- A. General
 1. Fabricate each locker with an individual door and frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.
 2. Fabricate lockers square, rigid, and without warp, with solid plastic faces flat and free of marks or distortion. Make exposed solid plastic edges free of sharp edges and burrs, and safe to touch. Attach frame members together to form a rigid, one-piece assembly.
- B. Locker box fabricated from a single sheet of HDPE with corners fused together. Weld frame and shelves to box assembly.
- C. Attach hinge to door and frame with vandal-resistant double threaded stainless steel screws.
- D. Continuous latch securely attached to the entire length of the door with stainless steel screws, providing a full length latching mechanism capable of accepting several lock types.
- E. Fabricate slope top from HDPE with a backing strip for attachment to wall.

- F. Locking device: Hasp
- G. Provide openings at top and bottom of each door for ventilation.
- H. Base: 4 inch high.
- I. Latch Bar
 - 1. Full length latch bar constructed of ½" thick High Density Polyethylene (HDPE) with a matte finish texture shall run entire length of door and provide a continuous security latching system.
 - 2. Latch shall lift up to open, and return to closed position after door is closed.
 - 3. Latch bar shall be secured to locker door with stainless steel security torx-head shoulder screws.
- J. Hinge
 - 1. Heavy duty, full-length piano hinge constructed of 16-gauge, type 304 stainless steel.
 - 2. Shall wrap around two edges of the door and the frame
 - 3. Secured with stainless steel security torxhead screws.
 - 4. Powdercoated to match locker color
 - 5. Field replaceable.
- K. Handle
 - 1. Constructed of injection molded plastic
 - 2. ADA compliant - operates with less than 5 lbs. of force.
 - 3. Secured through latch bar to door with stainless steel security torx-head screws.
- L. Hasp
 - 1. Constructed of 12 gauge stainless steel.
 - 2. Shall accept standard padlocks with 9/32" diameter (nominal).
 - 3. Secured to door behind latch bar with stainless steel screws.
- M. Coat Hook
 - 1. Double hook constructed of black polycarbonate.
 - 2. Furnished in one and two tier lockers
 - 3. Hook hangs centered under shelves in one-tier and ADA lockers; under locker top in 24" high lockers.
 - 4. Secured to shelves and tops with stainless steel screws.
- N. Number Plates
 - 1. Aluminum with numbers, secured with rivets into a recessed pocket cut into the door.
- O. Color to match lockers Factory finish:
 - 1. Tops, bottoms, side walls, backs, shelves, and continuous latch, smooth white commercial grade.
 - 2. Door, and door frames, slightly textured matte finish, color selected from manufacturer's standard.
 - 3. Hinge powdercoated to match door and frame.
 - 4. Base color: to be selected
 - 5. End panel color selected from manufacturer's standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that locker area is ready for installation.
- B. Verify field measurements are as shown on approved shop drawings.
- C. Verify that bases are properly, leveled, sized and in correct location.

- D. Verify correct location of built-in framing and blocking.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installation of lockers and bases. Install plumb and square.
- B. Anchor locker units to wall through the locker back with suitable anchor devices for the substrate.
- C. Anchor locker units to floor on base with hardware furnished by manufacturer or as shown in the drawings.
- D. Through-bolt adjoining locker units together to provide rigid installation.
- E. Install accessories, number plates, end panels, and sloped tops

3.3 ADJUSTING

- A. Section 01700 – Execution Requirements: Testing, adjusting, and balancing.
- B. Adjust and align components to operate smoothly.
- C. Correct minor damage to installed products; remove and replace work that cannot be satisfactorily repaired.

3.4 CLEANING

- A. Clean locker interiors and exterior surfaces.
- B. Remove packaging and construction debris, and legally dispose of off-site.

END OF SECTION 10500

SECTION 10522 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fire protection cabinets for fire extinguishers.

1.2 RELATED SECTIONS

- A. See Section 10523 for fire extinguisher requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work. Show locations of recessed, semi-recessed and surface-mounted cabinets and fire ratings of cabinets selected.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Coordinate size of fire extinguishers with local fire protection district.
- C. Coordinate size of fire protection cabinets to accommodate type and capacity of required fire extinguishers.
- D. Coordinate sizes and locations of fire protection cabinets with wall depths. Recess cabinets as far as possible, without interfering with type and rating of wall systems.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **Mechanical Areas:** Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

- B. **Public Areas:** Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher approved by local jurisdiction.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
 - a. Fire End & Croker Corporation
 - b. J. L. Industries, Inc., a division of Activar Construction Products Group
 - c. Kidde Residential and Commercial Division, Subsidiary of Kidde plc
 - d. Larsen's Manufacturing Company
 - e. Potter Roemer LLC
 - f. Watrous Division, American Specialties, Inc.
- B. Cabinet Construction: Rated to match wall.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: stainless in public areas; aluminum in mechanical areas.
- D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
 - 1. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
- E. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
 - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
- F. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim. Provide where walls are of insufficient depth for semirecessed cabinet installation.
 - 1. Surface mounted cabinets allowed in **mechanical areas only**.
 - 2. If surface-mounted cabinets are required in public areas, comply with protrusion and mounting height restrictions of ADAAG. Coordinate location and mounting with Architect through submittals.
- G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- H. Accessories:
 - 1. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as required.
- I. Finishes:
 1. Aluminum: Clear anodic.
 2. Stainless Steel: Brushed, Type 316 in pool areas, Type 304 elsewhere.

2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Select locations for recessed and semi-recessed cabinets, and verify installation depth prior to ordering/installation. Recess cabinets as far as possible into walls at locations indicated on shop drawings.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.
- C. Install fire protection cabinets in locations and at mounting heights acceptable to authorities having jurisdiction.
- D. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
- E. Identification: Apply decals at locations required.
- F. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- G. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10522

SECTION 10523 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers.

1.2 RELATED SECTIONS

- A. Section 10522 Fire Extinguisher Cabinets.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.
- C. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- C. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.
- D. Confirm size and capacity of extinguishers selected with local jurisdiction.**

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire End & Croker Corporation.
 - b. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - c. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - d. Larsen's Manufacturing Company.
 - e. Potter Roemer LLC.
2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
3. Type and capacity: : Type 10A:60B:C.
4. Locations: See Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction. See shop drawings specified in Section 10522 for locations and cabinets.

END OF SECTION 10523

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Toilet and bath accessories.

1.02 REFERENCE

- A. American National Standards from Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People ANSI A117.1.
- B. Uniform Federal Accessibility Standards (UFAS).

1.03 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Conform to requirements of ANSI A117.1 and UFAS for making facilities and accessories accessible to and usable by the physically handicapped.
- D. Conform to requirements of ASTM F446 for grab bars and accessories for test methods, anchorage and functional performance.
- E. Stamped names and labels on exposed faces of units will not be permitted.
- F. Provide locks with the same keying for each type of accessory unit in the Project where possible.

1.05 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. **Basis of Design: Provide accessories by Bobrick Washroom Equipment, Inc.**
- B. **See Drawings for accessory schedule.**

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.02 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10801

SECTION 12484 - ENTRANCE MATS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Entrance matting systems, including fibered modular tile entrance systems

1.2 REFERENCES

- A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. The Standards listed here are identified with a designation number, title or other designation established by the issuing authority.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C1028 Static Coefficient of Friction
 - 2. ASTM D2829 Pill Test
 - 3. ASTM E648 Radiant Panel Test

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide recessed fibered modular tile entranceway system, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.4 SUBMITTALS

- A. General: Submit listed submittals in accordance with the Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product data: Submit product data, including manufacturer's specification sheet and installation instructions for specified products. Include methods of installation and substrate preparation for each type of substrate.
- C. Shop drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.
- D. Samples: Submit samples for each type and color of exposed entrance mat, frames and accessories required. Provide 12-inch square samples of mat materials.
- E. Quality Assurance Submittals: (1) Certified test reports showing compliance with specified performance characteristics and physical properties, and (2) Manufacturer's Installation Instructions.
- F. Closeout Submittals: (1) Cleaning & Maintenance Data (Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance), and (2) Warranty.

1.5 QUALITY ASSURANCE

- A. Installer: Installer should be highly experienced in performing work of this section, having previously done work similar to that required for this project.

1.6 SEQUENCING/SCHEDULING

- A. Ordering: Comply with Manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Delivery: Deliver materials in Manufacturer's original, unopened, undamaged packaging.
- C. Storage: Store materials at temperature and in humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.
- D. Installation: Except as otherwise indicated herein, sequencing or scheduling for performance of work of this section in relation with other work is Contractor's option. Delay installation of mats until near time of substantial completion for the project.

1.7 PROJECT CONDITIONS

- A. Temperature: Maintain temperature where products will be installed before, during and after installation as recommended by Manufacturer.
- B. Field Measurements: Where possible, verify actual measurements by field measuring before fabrication and include measurements in shop drawings. To avoid construction delays, coordinate field measurements and fabrication schedule based upon construction progress.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide floor mats by Mats, Inc., PO Box 839, 37 Shuman Avenue, Stoughton, MA, 02072; telephone 800-MATS-INC (800-628-7462) or 781-344-1536; fax 781-344-1537; www.matsinc.com.
- B. Alternate manufacturers will be considered when submitted in accordance with section 01600, product substitution procedures

2.2 MATERIALS

- A. Polypropylene Modular Matting Tiles: 100 percent heavy denier, solution dyed, needle punched polypropylene with bitumen backing as follows:
 - 1. Pattern: Diagonal Tile
 - 2. Size: 19-11/16 by 19-11/16 by 3/8 inch thick
 - 3. Backing: bitumen backing
 - 4. Weight: 131 oz/sq. yd
 - 5. COF: 0.63 wet, 0.65 dry
 - 6. ASTMD2829 Pill Test: Pass
 - 7. ASTM E648 Radiant Panel Test: Passes Federal Flammability Standard
 - 8. Color to be selected from manufacturer's standard color range
 - 9. Adhesive for Mounting: Mats, Inc. Release-Bond Adhesive as recommended by manufacturer.

PART 3 - EXECUTION

3.1 SUBSTRATE PREPARATION

- A. Examine substrates and conditions where floor mats will be installed. Do not proceed with installation until unsatisfactory conditions are corrected. Sub floor shall be clean and dry, and within acceptable tolerances.

3.2 INSTALLATION

- A. General: Strictly comply with manufacturer's installation instructions and recommendations. Lay tile from center marks established with principal walls or general entrance area, discounting minor offsets, so that tiles at opposite edges of flooring area are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to flooring area axis, quarter-turning tiles using directional arrows as marked on the underside of the tile, unless otherwise directed. Coordinate installation with adjacent work to ensure proper clearances and to prevent tripping hazards.
- B. Sizes: Where possible, verify sizes by field measurement before shop fabrication.
- C. Accessories: Where indicated for recessed or wall-to-wall applications provide aluminum framework and aluminum ramping or vinyl transition strips as recommended by manufacturer.

3.3 EXTRA STOCK

- A. Turn extra materials over to Owner

3.4 CLEANING AND PROTECTION

- A. General Cleaning: Refer to Manufacturer's Cleaning and Maintenance Instructions.
- B. Owner's Personnel: Instruct Owner's personnel in proper maintenance procedures.
- C. Protection: Protect installed product and finish surfaces from damage during construction and until acceptance.

END OF SECTION 012484

