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PROCUREMENT AND CONTRACTING REQUIREMENTS

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END OF SECTION

SECTION 00 3100 - AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents, as follows:
- B. Geotechnical Report: Entitled Geotechnical Subsurface Exploration Program Planet Fitness - University Square Greeley CO, dated September 7, 2017.
 - 1. Original copy is available for inspection at Owner's offices during normal business hours.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 5000 - CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 AGREEMENT AND CONDITIONS OF THE CONTRACT

1.02 FORMS

- A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.
- B. Post-Award Certificates and Other Forms:
 - 1. Submittal Transmittal Letter Form: Contractor's standard form is acceptable..
 - 2. Schedule of Values Form: AIA G703.
 - 3. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).
- C. Clarification and Modification Forms:
 - 1. Request for Information/Interpretation Form: Contractor's standard form is acceptable..
 - 2. Substitution Request Form (During Construction): Contractor's standard form is acceptable..
 - 3. Architect's Supplemental Instructions Form: AIA G710.
 - 4. Construction Change Directive Form: AIA G714.
 - 5. Change Order Form: AIA G701.
- D. Closeout Forms:
 - 1. Certificate of Substantial Completion Form: AIA G704.

1.03 REFERENCE STANDARDS

- A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum.
- B. AIA A201 - General Conditions of the Contract for Construction.
- C. AIA G701 - Change Order.
- D. AIA G702 - Application and Certificate for Payment.
- E. AIA G703 - Continuation Sheet.
- F. AIA G704 - Certificate of Substantial Completion.
- G. AIA G710 - Architect's Supplemental Instructions.
- H. AIA G714 - Construction Change Directive.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1000 - SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: University Square - Planet Fitness Core and Shell
- B. Owner's Name: W-ADP University Square Owner VII, LLC.
- C. Architect's Name: Farnsworth Group.
- D. The Project consists of the alteration and construction of core and shell space for a fitness facility.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on the Cost of the Work plus a fee as described in Document 00 5000 - Contracting Forms and Supplements.

1.03 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 4100.
- B. Plumbing: Alter existing system and add new construction, keeping existing in operation.
- C. HVAC: Alter existing system and add new construction, keeping existing in operation.
- D. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.
- E. Fire Suppression Sprinklers: Alter existing system and add new construction, keeping existing in operation.
- F. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.
- G. Telephone: Alter existing system and add new construction, keeping existing in operation.
- H. Contractor shall remove and store the following prior to start of work, for later reinstallation by Contractor:

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Arrange use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Work by Others.
- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- I. Submit one electronic and three hard-copies of each Application for Payment.
- J. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 3000.
 - 2. Construction progress schedule, revised and current as specified in Section 01 3000.
 - 3. Partial release of liens from major subcontractors and vendors.
 - 4. Affidavits attesting to off-site stored products.

- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.04 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within ____ days.
- D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- F. Substantiation of Costs: Provide full information required for evaluation.
 - 1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 - 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

- I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- J. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 7000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2200 - UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. Measurements and quantities will be verified by Owner.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.
- D. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- E. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.05 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. Payment will not be made 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. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected Products.

1.06 DEFECT ASSESSMENT

- A. Replace Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
 - 1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect.
 - 2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.
- C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.
- D. The authority of Architect to assess the defect and identify payment adjustment is final.

PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Construction progress schedule.
- D. Submittals for review, information, and project closeout.
- E. Number of copies of submittals.
- F. Submittal procedures.

1.02 PROJECT COORDINATOR

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for site access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.
 - 12. Other specified submittals..

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Project Coordinator will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.

5. Designation of personnel representing the parties to Contract, _____ and Architect.
 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- B. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Maintenance of progress schedule.
 7. Corrective measures to regain projected schedules.
 8. Planned progress during succeeding work period.
 9. Maintenance of quality and work standards.
 10. Effect of proposed changes on progress schedule and coordination.
 11. Other business relating to work.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.04 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.

- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.05 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in conformance to requirements of Section 01 7800 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.07 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Extra Copies at Project Closeout: See Section 01 7800.
- C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.08 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a single transmittal for related items.
 - 2. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 - 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - 6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Deliver submittals to Architect at business address.
 - 7. Schedule submittals to expedite the Project, and coordinate submission of related items.

- a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. Provide space for Contractor and Architect review stamps.
10. When revised for resubmission, identify all changes made since previous submission.
11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
13. Submittals not requested will not be recognized or processed.

3.09 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architect's and his consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 2. Not Authorizing fabrication, delivery, and installation:
- E. Architect's and his consultants' actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 3114 - FACILITY SERVICES COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Services of a coordinator for facility services construction.
- B. Coordination documents.

1.02 MECHANICAL AND ELECTRICAL COORDINATOR

- A. Employ and pay for services of a person, technically qualified and administratively experienced in field coordination of the type of work required to be coordinated, for the duration of the Work.

1.03 SUBMITTALS

- A. Submit name, address, and telephone number of coordinator and name of principal officer for review.
- B. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 COORDINATION REQUIRED

- A. Coordinate the work listed below:
 - 1. Fire Suppression: Division 21.
 - 2. Plumbing: Division 22.
 - 3. Heating, Ventilating, and Air Conditioning: Division 23.
 - 4. Integrated Automation: Division 25.
 - 5. Electrical: Division 26.
 - 6. Communications: Division 27.
 - 7. Electronic Safety and Security: Division 28.
 - 8. Site Utilities: Division 33.
- B. Coordinate progress schedules, including dates for submittals and for delivery of products.
- C. Conduct meetings among subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- D. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.

3.02 COORDINATION DOCUMENTS

- A. Prepare coordination drawings to organize installation of products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.
- B. Prepare a master schedule identifying responsibilities for activities that directly relate to this work, including submittals and temporary utilities; organize by specification section.
- C. Identify electrical power characteristics and control wiring required for each item of equipment.
- D. Maintain documents for the duration of the work, recording changes due to site instructions, modifications or adjustments.

3.03 COORDINATION OF SUBMITTALS

- A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.
- B. Check field dimensions and clearances and relationship to available space and anchors.
- C. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.
- D. Check motor voltages and control characteristics.

- E. Coordinate controls, interlocks, wiring of switches, and relays.
- F. Coordinate wiring and control diagrams.
- G. When changes in the work are made, review their effect on other work.
- H. Verify information and coordinate maintenance of record documents.

3.04 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

- A. Review proposals and requests for substitution prior to submission to Architect.
- B. Verify compliance with Contract Documents and for compatibility with work of other sections.
- C. Submit with recommendation for action.

3.05 OBSERVATION OF WORK

- A. Observe work for compliance with Contract Documents.
- B. Maintain a list of observed deficiencies and defects; promptly submit.

3.06 DOCUMENTATION

- A. Observe and maintain a record of tests. Record:
 - 1. Specification section number and product name.
 - 2. Name of Contractor, subcontractor, and _____.
 - 3. Name of testing agency and name of inspector.
 - 4. Name of manufacturer's representative present.
 - 5. Date, time, and duration of tests.
 - 6. Type of test, and results.
 - 7. Retesting required.
- B. Assemble background documentation for dispute and claim settlement.
- C. Submit copies of documentation to Architect upon request.

3.07 EQUIPMENT START-UP

- A. Verify utilities, connections, and controls are complete and equipment is in operable condition as required by Section 01 7000.
- B. Observe start-up and adjustments, test run, record time and date of start-up, and results.
- C. Observe equipment demonstrations made to Owner; record times and additional information required for operation and maintenance manuals.

3.08 INSPECTION AND ACCEPTANCE OF EQUIPMENT

- A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.
- B. Assist Architect with review. Prepare list of items to be completed and corrected.

END OF SECTION

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Control of installation.
- E. Mock-ups.
- F. Tolerances.
- G. Manufacturers' field services.
- H. Defect Assessment.

1.02 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.
- G. IAS AC89 - Accreditation Criteria for Testing Laboratories.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

3.02 MOCK-UPS

- A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and _____ as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4100 - REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Obtain and pay for required permits, fees, licenses, and inspections as stipulated in the Agreement.
- B. Arrange for required regulatory inspections and approvals.
- C. Verify applicable codes and regulations.
- D. Comply with applicable codes and regulations as stipulated in the Agreement.
 - 1. Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.
 - 2. Contractor is required to promptly report to Architect any nonconformity discovered by or made known to Contractor as a request for information as specified, or in such form as Architect may otherwise require.
- E. Listing of applicable Codes and regulations in this Section is not to be considered complete and all-inclusive; listing refers to primary applicable Codes and regulations only. See Drawings for additional information.

1.02 SUMMARY OF APPLICABLE CODES AND REFERENCE STANDARDS

- A. Federal Regulations (Including but not limited to); currently adopted editions of the following, unless noted otherwise:
 - 1. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
 - 2. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
 - 3. 29 CFR 1910 - Occupational Safety and Health Standards.
- B. City of Greeley, State of the State of Colorado Regulations, and other regulations (including but not limited to); currently adopted editions of the following, unless noted otherwise:
 - 1. Zoning Code: Local jurisdiction.
 - 2. Fire Protection District: Local jurisdiction.
 - 3. ICC A117.1 - Accessible and Usable Buildings and Facilities.
 - 4. ICC (IFC) - International Fire Code.
 - 5. ICC (IBC) - International Building Code.
 - 6. ICC (IPC) - International Plumbing Code.
 - 7. ICC (IMC) - International Mechanical Code.
 - 8. ICC (IFGC) - International Fuel Gas Code.
 - 9. NFPA 70 - National Electrical Code.
 - 10. ICC (IECC) - International Energy Conservation Code.
 - 11. Erosion and Sedimentation Control Regulations: Local jurisdiction, unless otherwise specified.

1.03 QUALITY ASSURANCE

- A. Become familiar with applicable requirements of codes and regulations.
- B. Verify that substituted materials and equipment used in the Work meet or exceed requirements of applicable codes and regulations.
- C. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State of Colorado.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4216 - DEFINITIONS AND EXPLANATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section supplements the definitions contained in the General Conditions and other Contract Documents.
- B. Other definitions are included in individual specification Sections.
- C. Limitations: Definitions and explanations are not necessarily complete or exclusive, but are generally applicable to the Work to the extent such definitions or explanations are not stated more explicitly in other provisions of the Contract Documents.

1.02 SPECIFICATION EXPLANATIONS

- A. General: Explanations are provided to assist in understanding format, language, implied requirements and conventions of specification content. None of these explanations will be interpreted to modify the substance of content requirements.
- B. Division 01 General Requirements: Expand on the broad provisions of the Conditions of the Contract, and govern the execution of the work of all Sections of the specifications. Division 01 General Requirements specify administrative and procedural requirements relating to execution of the Work, and temporary facilities for use during the construction period.
- C. Sections and Divisions: The basic unit of specification text is the "Section," each of which is named and numbered. These are organized into related families called "Divisions," which generally conform to the most current edition of "MasterFormat" as published by CSI. Any Section title is not intended to limit meaning or content of Section, nor to be fully descriptive of requirements specified therein, nor to be an integral part of the text.
- D. Imperative Language: Used generally in the Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe the responsibilities which must be fulfilled either indirectly by Contractor, or when so noted by others.

1.03 SPECIFICATION CONTENT CONVENTIONS

- A. Overlapping Requirements: Where compliance with two or more industry standards or sets of requirements is specified, and overlapping of those requirements also establishes different or conflicting minimums or levels of quality, the more stringent requirement will be enforced (which is generally the more costly level).
- B. Refer apparently equal but different requirements and uncertainties as to which level of quality is required to Architect for interpretation or decision before proceeding.
- C. Specification Minimum: In every instance, the specified requirement is the minimum to be performed or fulfilled. In complying with minimum requirements, the indicated numeric values are either minimums or maximums as noted or as appropriate for the context of the requirement. Refer instances of uncertainty to Architect for decision.
- D. Abbreviations: The language of the Specifications and elsewhere in the Contract Documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual work abbreviations of a self-explanatory nature have been included in the text.
- E. Trade associations and general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular wherever applicable and wherever the full context of the requirements so indicate.
- F. Specialists: In certain instances the Specification text may require that specific work be assigned to certain specialists or expert entities for the performance of those units of the Work. These are specified as requirements on which the Contractor has no choice or option.

1.04 DEFINITIONS

- A. Approve/Approved: Where used in conjunction with Architect's or Architect's consultant response to submittals, requests, applications, inquiries, reports, and claims by Contractor, the meaning of the term "approve" or "approved" will be held to the limitations of Architect's responsibilities and duties as specified in Section 01 3000 and stipulated in the General Conditions of the Contract. In no case will approval by Architect be interpreted as an assurance to Contractor that the requirements of the Contract Documents have been fulfilled.
- B. By Others: Work performed by entities outside the Contract; interchangeable with "NIC" or "Not in Contract."
- C. Contract Documents: Those documents defined in the Owner-Contractor Agreement (Contract) as applicable to the construction of the Project by Contractor.
 - 1. Refer to General Conditions of the Contract for Construction for broader definition of this term.
- D. Contractor's Option: Where materials, products, systems or methods are specified to be at Contractor's option, the choice of which material, method, product, or system will be used is solely Contractor's. There will be no change in Contract Sum or Time because of such choice.
- E. Demolish (Demo): Dismantle a defined component of existing construction, remove it from the Site, and dispose of it either as specified or in lawful manner.
- F. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect", "requested by Architect", etc. However, no such implied meaning will be interpreted to extend Architect's responsibility into Contractor's area of construction supervision.
- G. Dispose: Remove from the Project Site in lawful manner.
- H. Drawings: Capitalized term referring to the drawings prepared by Architect and its design consultants, and by any Owner consultants as applicable; bound and published as a sub-set of the Contract Documents as defined in Owner-Contractor Agreement (Contract). Non-capitalized term "drawings" used in the Contract Documents generally refers to other drawings not part of the Contract Documents, unless the context explicitly indicates otherwise.
 - 1. Refer to General Conditions of the Contract for Construction for broader definition of this term.
- I. Equipment: Defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including connections (wiring, piping, etc.).
- J. Final Acceptance: The administrative action taken by Owner authorizing final payment and settlement of the Contract.
- K. Furnish: To supply, deliver, unload, and inspect for damage (by Contractor).
- L. General Requirements: Provisions or requirements of Division 01 specification Sections. General Requirements apply to the entire Work of the Contract and, where so indicated, to other elements of work which are included in the Project. See specification explanations in this Section.
- M. Indicated: Cross reference to details, notes or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar means of recording requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader accomplish the cross reference, and no limitation is intended except as specifically noted.
- N. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use (by Contractor).
- O. Installer: The entity (person or firm) engaged by Contractor or his Subcontractor or Sub-subcontractor for the performance of a particular unit of work at the project site, including installations, erection, application and similar required operations.

- P. Material(s): Defined as products which must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of work.
- Q. Not in Contract (NIC): Work performed by entities outside the Contract; interchangeable with "By Others."
- R. Product(s): Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- S. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the Specifications.
- T. Provide: To furnish and install.
- U. Reinstall: Install a removed component of existing construction into new construction as indicated.
- V. Remove: Dismantle a defined component of existing construction in a manner which protects and preserves the component for future use/installation; definition includes lawful disposal, unless otherwise specifically indicated to be reinstalled, salvaged, or other described action.
- W. Salvage: See Section 01 7419 for primary definition; also, in context, may mean: Remove in a manner preserving the existing condition and integrity of the component, set aside, store and protect for future reinstallation.
- X. Supply: Same as Furnish.
- Y. Testing Agency/Laboratory: An independent entity engaged to perform specific inspections or tests of the Work, either at the project site or elsewhere; and to report and (if required) interpret the results of those inspections or tests.
- Z. Work (the Work): Capitalized term referring to the entire scope of work of the Project as defined in the Contract Documents. Non-capitalized term "work" used in the Contract Documents generally refers to work by specific trades or other entities as components or phases of the Work, unless the context explicitly indicates otherwise.
 - 1. Refer to General Conditions of the Contract for Construction for broader definition of this term.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4533 - CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Code-required special inspections.
- B. Testing services incidental to special inspections.
- C. Submittals.

1.02 DEFINITIONS

- A. Code or Building Code: ICC (IBC), 2015 Edition of the International Building Code and specifically, Chapter 17 - Special Inspections and Tests.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
- C. National Institute of Standards and Technology (NIST).
- D. Special Inspection:
 - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
 - 2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.03 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- B. AISC 360 - Specification for Structural Steel Buildings.
- C. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- D. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.
- E. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- G. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- I. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.
- J. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel.
- K. ICC (IBC) - International Building Code.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency shall:
 - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
- C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency shall:

1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 3. Submit certification that Testing Agency is acceptable to AHJ.
- D. Special Inspection Reports: After each special inspection, Special Inspector shall promptly submit two copies of report; one to Architect and one to the AHJ.
1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of Special Inspector.
 - d. Date and time of special inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of special inspection.
 - h. Date of special inspection.
 - i. Results of special inspection.
 - j. Conformance with Contract Documents.
 2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

1.05 SPECIAL INSPECTION AGENCY

- A. Owner or Architect will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.
- C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.06 TESTING AND INSPECTION AGENCIES

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
 1. Continuous Special Inspection: Special Inspection Agency shall be present in the area where the work is being performed and observe the work at all times the work is in progress.
 2. Periodic Special Inspection: Special Inspection Agency shall be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.02 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION

- A. High-Strength Bolt, Nut and Washer Material:
 1. Verify identification markings conform to ASTM standards specified in the approved contract and to AISC 360, Section A3.3; periodic.
 2. Submit manufacturer's certificates of compliance; periodic.
- B. High-Strength Bolting Installation: Verify items listed below comply with AISC 360, Section M2.5.
 1. Snug tight joints; periodic.
- C. Structural Steel and Cold Formed Steel Deck Material:

1. Structural Steel: Verify identification markings conform to AISC 360, Section M3.5; periodic.
 2. Other Steel: Verify identification markings conform to ASTM standards specified in the approved contract documents; periodic.
 3. Submit manufacturer's certificates of compliance and test reports; periodic.
- D. Weld Filler Material:
1. Verify identification markings conform to AWS standards specified in the approved contract documents and to AISC 360, Section A3.5; periodic.
 2. Submit manufacturer's certificates of compliance; periodic.
- E. Welding:
1. Structural Steel and Cold Formed Steel Deck:
 - a. Complete and Partial Joint Penetration Groove Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
 - b. Multipass Fillet Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
 - c. Single Pass Fillet Welds Less than 5/16 inch Wide: Verify compliance with AWS D1.1/D1.1M; periodic.
 - d. Plug and Slot Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
 - e. Single Pass Fillet Welds 5/16 inch or Greater: Verify compliance with AWS D1.1/D1.1M; continuous.
 - f. Floor and Roof Deck Welds: Verify compliance with AWS D1.3/D1.3M; continuous.
 2. Reinforcing Steel: Verify items listed below comply with AWS D1.4/D1.4M and ACI 318, Section 3.5.2.
 - a. Verification of weldability; periodic.
 - b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames as well as boundary elements of special structural walls of concrete and shear reinforcement; continuous.
 - c. Shear reinforcement; continuous.
 - d. Other reinforcing steel; periodic.
- F. Steel Frame Joint Details: Verify compliance with approved contract documents.
1. Details, bracing and stiffening; periodic.
 2. Member locations; periodic.
 3. Application of joint details at each connection; periodic.

3.03 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

- A. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved contract documents and ACI 318, Sections 3.5 and 7.1 through 7.7; periodic.
- B. Reinforcing Steel Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, Section 3.5.2; periodic.
- C. Design Mix: Verify plastic concrete complies with the design mix in approved contract documents and with ACI 318, Chapter 4 and 5.2; periodic.
- D. Specified Curing Temperature and Techniques: Verify compliance with approved contract documents and ACI 318, Sections 5.11 through 5.13; periodic.
- E. Concrete Strength in Situ: Verify concrete strength complies with approved contract documents and ACI 318, Section 6.2, for the following.
- F. Formwork Shape, Location and Dimensions: Verify compliance with approved contract documents and ACI 318, Section 6.1.1; periodic.

3.04 SPECIAL INSPECTIONS FOR SOILS

- A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
 1. Design bearing capacity of material below shallow foundations; periodic.
 2. Design depth of excavations and suitability of material at bottom of excavations; periodic.
 3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.

4. Subgrade, prior to placement of compacted fill; periodic.
- B. Testing: Classify and test excavated material; periodic.

3.05 OTHER SPECIAL INSPECTIONS

- A. Provide for special inspection of work that, in the opinion of the AHJ, is unusual in nature.
- B. For the purposes of this section, work unusual in nature includes, but is not limited to:
 1. Construction materials and systems that are alternatives to materials and systems prescribed by the building code.
 2. Unusual design applications of materials described in the building code.
 3. Materials and systems required to be installed in accordance with the manufacturer's instructions when said instructions prescribe requirements not included in the building code or in standards referenced by the building code.
- C. Alternative Test Procedures: Where approved rules and standards do not exist, test materials and assemblies as required by AHJ or provide AHJ with documentation of quality and manner in which those materials and assemblies are used.

3.06 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 2. Perform specified sampling and testing of products in accordance with specified reference standards.
 3. Ascertain compliance of materials and products with requirements of Contract Documents.
 4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of work or products.
 5. Perform additional tests and inspections required by Architect.
 6. Submit reports of all tests or inspections specified.
- B. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- C. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.07 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 2. Perform specified sampling and testing of products in accordance with specified standards.
 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of work or products.
 5. Perform additional tests and inspections required by Architect.
 6. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the work.
- C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.08 CONTRACTOR DUTIES AND RESPONSIBILITIES

- A. Contractor Responsibilities, General:
 - 1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
 - 2. Cooperate with agency and laboratory personnel; provide access to the work, to manufacturers' facilities, and to fabricators' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to work to be tested or inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
 - c. To facilitate tests or inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
 - 5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

END OF SECTION

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

1.02 TEMPORARY UTILITIES - SEE SECTION 01 5100

- A. Owner will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.
- B. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Telephone Land Lines: One line, minimum; one handset per line.
 - 3. Internet Connections: Minimum of one; DSL modem or faster.
 - 4. Email: Account/address reserved for project use.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.
- C. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 SECURITY - SEE SECTION 01 3553

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

1.09 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on Drawings.
- B. Erect on site at location indicated.
- C. No other signs are allowed without Owner permission except those required by law.

1.12 FIELD OFFICES - SEE SECTION 01 5213

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
 - 1. See Section 01 1000 for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Where all other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 6116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
 - 3. Have a published GreenScreen Chemical Hazard Analysis.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

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

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 2500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. General requirements for maintenance service.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
 - 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Alternatives to cutting and patching.
 - f. Effect on work of Owner or separate Contractor.
 - g. Written permission of affected separate Contractor.
 - h. Date and time work will be executed.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.03 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of 5 years of documented experience.
- B. For survey work, employ a land surveyor registered in the State of Colorado and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State of Colorado.
- D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State of Colorado.

1.04 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.05 COORDINATION

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and _____.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations, and _____.
- I. Periodically verify layouts by same means.
- J. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-conforming work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- I. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 7900 - Demonstration and Training.
- B. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

3.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and _____.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Owner will occupy all of the building as specified in Section 01 1000.
- F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- H. Accompany Architect on Contractor's preliminary final inspection.
- I. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- J. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 MAINTENANCE

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

- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests.
 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Include test and balancing reports.
- O. Additional Requirements: As specified in individual product specification sections.

3.04 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Operation and maintenance data.
 - c. Field quality control data.
 - d. Photocopies of warranties and bonds.

3.05 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Include photocopies of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Fixtures and fittings.
 - 3. Items specified in individual product Sections.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Owner.
 - 2. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 3. Submit not less than four weeks prior to start of training.
 - 4. Revise and resubmit until acceptable.
 - 5. Provide an overall schedule showing all training sessions.
 - 6. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.

3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
 4. Include Commissioning Authority's formal acceptance of training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
 2. Label each disc and container with session identification and date.

1.03 QUALITY ASSURANCE

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
1. The location of the O&M manuals and procedures for use and preservation; backup copies.

2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:
1. Review the applicable O&M manuals.
 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02 4100 - DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building demolition excluding removal of hazardous materials and toxic substances.
- B. Selective demolition of existing site elements.
- C. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 1000 - Summary: Sequencing and staging requirements.
- C. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- E. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- F. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- G. Section 02 6500 - Underground Storage Tank Removal.

1.03 DEFINITIONS

- A. Demolish (Demo): Dismantle a defined component of existing construction, remove it from the Site, and dispose of it either as specified or in lawful manner.
- B. Dispose: Remove from the Project Site in lawful manner.
- C. Reinstall: Install a removed component of existing construction into new construction as indicated.
- D. Remove: Dismantle a defined component of existing construction in a manner which protects and preserves the component for future use/installation; definition includes lawful disposal, unless otherwise specifically indicated to be reinstalled, salvaged, or other described action.
- E. Salvage: Remove in a manner preserving the existing condition and integrity of the component, set aside, store and protect for future reinstallation.

1.04 REFERENCE STANDARDS

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

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices.
 - 3. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.

- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.07 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of five years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 31 2300.

PART 3 EXECUTION

3.01 SCOPE

- A. Remove portions of existing buildings as indicated on Drawings.
- B. Remove paving and curbs as required to accomplish new work.
- C. Within area of new construction, remove existing foundation elements completely.
- D. Outside area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.
- E. Remove concrete slabs on grade within site boundaries.
- F. Remove underground tanks.
- G. Remove underground tanks that contain or once contained petroleum products; fill and bury other types of tanks.
- H. Remove manholes and manhole covers, curb inlets and catch basins.
- I. Remove fences and gates.
- J. Remove other items as specifically indicated on Drawings.
- K. Remove items specifically indicated for salvage, relocation, and recycling.
- L. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 2300.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

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

- D. Do not begin removal until existing elements to be salvaged or relocated have been removed.
- E. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- F. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- G. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- H. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.
- J. Underground Storage Tanks: Remove and dispose of as specified in Section 02 6500.

3.03 EXISTING UTILITIES

- A. Protect existing utilities to remain from damage.
- B. Do not disrupt public utilities without permit from authority having jurisdiction.
- C. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- D. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- E. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- F. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- G. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on Drawings.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on Drawings.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. See Section 01 1000 for other limitations on outages and required notifications.
 4. Verify that abandoned services serve only abandoned facilities before removal.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

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

END OF SECTION

SECTION 03 1000 - CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.
- E. Design engineering for formwork system.

1.02 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301 - Specifications for Structural Concrete.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- D. ACI 347R - Guide to Formwork for Concrete.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with work of other Sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
 - 2. Coordinate this Section with other Sections of work that require attachment of components to formwork.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on void form materials and installation requirements.
- C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
- D. Delegated Design Data: As required by authorities having jurisdiction.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in the State of Colorado.
- B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Limit concrete surface irregularities, designated as abrupt or gradual according to ACI 347R, as follows:
 - 1. Class B: 1/4 inch for rough formed finished surfaces.
 - 2. Permissible irregularity is a cumulative value due to all sources including layout, plumbness, member size, formwork offsets, joints, and member levelness. Permissible irregularity also applies between adjacent concrete surfaces on opposite sides of construction joints, expansion joints, or shrinkage pour strip if present.

- C. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
- D. Chamfer outside corners of beams, joists, columns, and walls unless specifically indicated otherwise.
- E. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.
- F. Comply with applicable portions of ACI 347R, ACI 301, and ACI 318.
- G. Form Types:
 - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance, complying with other specified requirements.

2.02 WOOD FORM MATERIALS

- A. Forming Materials - General: Use formwork consisting of sustainably harvested wood, salvaged and reused wood, wood fabricated from recovered timber, or regionally-sourced wood; specific materials used meeting these material criteria are at the discretion of Contractor.
 - 1. Comply with regionally-sourced and sustainably harvested wood product requirements specified in Section 6000.

2.03 REMOVABLE PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

2.04 FORMWORK ACCESSORIES

- A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, 1 inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - 1. Composition: Colorless reactive, mineral oil-based, soy-based, or vegetable-oil based compound.
 - 2. Do not use materials containing diesel oil or petroleum-based compounds.
 - 3. VOC Content: None; water-based.
- C. Filler Strips for Chamfered Corners: Wood strip type; 3/4 x 3/4 inch size; maximum possible lengths.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- E. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 5000.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 EARTH FORMS

- A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members that are not indicated on Drawings.
- F. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- D. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- E. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
 1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
 2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

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

3.08 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.09 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 2000 - CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- C. ACI SP-66 - ACI Detailing Manual.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- E. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- G. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel.
- H. CRSI (DA4) - Manual of Standard Practice.
- I. CRSI (P1) - Placing Reinforcing Bars.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
 - 1. Provide 1/4 inch scale elevations of all walls and grade beams with reinforcing shown.
 - 2. Show splice locations, if any.
 - 3. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State of Colorado.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.04 QUALITY ASSURANCE

- A. Perform work of this Section in accordance with CRSI (DA4), CRSI (P1), ACI 301, ACI SP-66, and ACI 318.
- B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
- B. Reinforcing Steel for Welded Connections and Splices: ASTM A706/A706M, deformed low-alloy steel bars.
 - 1. Unfinished.
- C. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.
- D. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.

2. Mesh Size and Wire Gage: As indicated on Drawings.
- E. Reinforcement Accessories:
1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement, including load bearing pad on bottom to prevent vapor retarder puncture. Wood, brick, or other foreign material is not permitted.
 3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.
- C. Locate reinforcing splices not indicated on Drawings at point of minimum stress.
 1. Review locations of splices with Architect.
 2. Show splice locations on shop drawings.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor retarders.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcing as specified on Drawings.
- E. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions; splice laps with tie wire.
- F. Before placing concrete, clean reinforcement of foreign particles and substances.

3.02 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 01 4000, will inspect installed reinforcement for conformance to contract documents before concrete placement.
- B. Reinforcing with any of the following defects will not be permitted in the work:
 1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
 2. Bends or kinks not indicated on Drawings or final shop drawings.
 3. Bars with reduced cross-sections due to excessive rusting or other cause.

END OF SECTION

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floors and non-paving slabs on grade.
- B. Concrete footings and foundation walls.
- C. Joint devices associated with concrete work.
- D. Miscellaneous concrete elements, including equipment pads, light pole bases, thrust blocks, and similar items.
- E. Underslab vapor retarder.
- F. Concrete curing.

1.02 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- C. ACI 301 - Specifications for Structural Concrete.
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- F. ACI 305R - Hot Weather Concreting.
- G. ACI 308R - Guide to Curing Concrete.
- H. ACI 309R - Guide for Consolidation of Concrete.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- M. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
- N. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- O. ASTM C150/C150M - Standard Specification for Portland Cement.
- P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
- Q. ASTM C295/C295M - Standard Guide for Petrographic Examination of Aggregates for Concrete; 2012.
- R. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- S. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- T. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- U. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- V. ASTM C1293 - Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction; 2008b.
- W. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- X. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

- Y. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- Z. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- AA. PCA (GS) - Portland Cement Association; Guide Specification for Concrete Subject to Alkali-Silica Reactions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of foundations with size, location and installation of underground service utilities.
 - 2. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
 - 3. Coordinate the use and application of specified curing methods for slabs and floor surfaces with accepted flooring system manufacturers.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this Section.
 - 1. Convene under general provisions of Section 01 7000.
 - 2. Required Attendance: Contractor's quality control supervisor or superintendent, Architect, structural engineer, Owner's independent testing agency, and all affected trades including reinforcing subcontractor and concrete supplier.
 - 3. Discuss construction document requirements, required clarifications to construction documents, construction schedule, and coordination of affected trades.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on all specified manufactured products showing compliance with specified requirements and installation instructions.
 - 1. Curing Compounds: Provide data on method of removal in the event of incompatibility with floor covering adhesives.
 - 2. Moisture Emission Reducing Curing and Sealing Compound: Provide manufacturers specifications and product data showing application requirements and limitations, requirements for establishing and maintaining specified warranty, and quality assurance requirements of manufacturer.
 - 3. Under-Slab Vapor Retarder: Provide data on specified products, including all accessory components of vapor retarder system.
- C. Mix Designs: Submit proposed mix design for each class of concrete specified. Include mix identification number (unique for each submitted mix), intended use of mix, air content, proportions of ingredients, aggregate analysis, cement brand and type, slump, water/cement ratio, and strength test reports for 7 and 28 day strengths.
 - 1. Indicate proposed mix design complies with applicable requirements of ACI 301, Section 4 - Concrete Mixtures and Chapter 5 - Concrete Quality, Mixing and Placing.
 - 2. Provide specific aggregate analysis for recycled aggregates proposed for use in concrete mixes.
 - 3. Fly-Ash Content Submittal: If any fly ash or ground granulated blast furnace slag is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Manufacturer's Installation Instructions: For concrete accessories, curing compounds, and admixtures, indicate installation procedures and interface required with adjacent construction.
- F. Manufacturer's Certificate: Provide written certification for each admixture actually used that admixtures contain no thiocyanates, and admixtures do not exceed 0.05 percent chloride ions.

- G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

- A. Perform work of this Section in accordance with ACI 117, ACI 301, and ACI 318.
- B. Follow recommendations of ACI 301 when concreting during hot and cold weather.

PART 2 PRODUCTS

2.01 FORMING

- A. Comply with requirements of Section 03 1000.

2.02 REINFORCING

- A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 - 1. Acquire all cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33.
 - 1. Acquire all aggregates for entire project from same source.
 - 2. Tested according to ASTM C295/C295M or ASTM C1293 and according to PCA (GS) Section 5.1.
- C. Fly Ash: ASTM C618, Class C or F.
 - 1. Acquire all fly ash for entire project from same source.
 - 2. Limit use to following maximum percentages of cement content, by weight, unless otherwise specified:
 - a. Foundations: 50 percent.
 - b. Slab on Grade, Shear Wall Foundations, Concrete on Metal Deck, and Site Concrete: 25 percent.
 - c. All Other Concrete: Zero (0) percent.
 - d. Do not use fly-ash or slag materials that come from sources co-fired with hazardous waste, medical waste, or tire-derived fuel.
- D. Water: ASTM C1602/C1602M; clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.05 percent by weight of cement.
 - 1. Use of calcium chloride is not permitted.
- B. Use of admixtures will not relax cold weather placement requirements.
- C. Admixtures:
 - 1. Air Entrainment Admixture: ASTM C260/C260M.
 - 2. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
 - 3. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
 - 4. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
 - 5. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
 - 6. Accelerating Admixture: ASTM C494/C494M Type C.
 - 7. Retarding Admixture: ASTM C494/C494M Type B.
 - 8. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; maximum permeance of 0.01 as measured according to ASTM E96/E96M; nominal thickness 15 mils; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.

1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
2. Acceptable Products:
 - a. Fortifiber Building Systems Group; Moistop Ultra 15: www.fortifiber.com/#sle.
 - b. Insulation Solutions, Inc.; Viper VaporCheck II 15-mil (Class A): www.insulationsolutions.com.
 - c. Stego Industries, LLC; Stego Wrap Class A - 15 mils: www.stegoindustries.com.
 - d. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils: www.wrmeadows.com.
 - e. Raven Industries, Inc.; VAPORBLOCK VB 15: www.ravenind.com.
 - f. Substitutions: See Section 01 6000 - Product Requirements.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 1. Grout: Comply with ASTM C1107/C1107M.
 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.06 BONDING AND JOINTING PRODUCTS

- A. Bonding Agent: Polyvinyl acetate or acrylic base, re-wettable type.
- B. Epoxy Filler: Two-part liquid, 100 percent solids epoxy resin; gray color.
- C. Epoxy Resin: Two-part, pourable or injection-applied epoxy resin; gray color.
- D. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
 1. Material: Closed-cell, non-absorbent, compressible polyethylene or polymer foam in sheet form.
- E. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
- F. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.
 1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
 2. Height: To suit slab thickness.

2.07 CURING MATERIALS

- A. Curing Compound - Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
 1. Product dissipates within 4 to 6 weeks.
 2. Acceptable Products:
 - a. W. R. Meadows, Inc; 1100-Clear: www.wrmeadows.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.08 CONCRETE MIX DESIGN - GENERAL

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, project conditions, weather, test results, or other circumstances indicate necessary adjustments, at no additional cost to the Owner, and as accepted by the Architect. Laboratory test data for revised mix design and strength results must be submitted to Architect and accepted before use of revised mix designs in the Work.

2.09 CONCRETE MIXES

- A. See Drawings for concrete mix design schedule.

2.10 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
 1. Deliver concrete and discharge entire load within 1-1/2 hours, or before drum has turned 300 revolutions, whichever occurs first, after introduction of mixing water.
 2. During cold weather (below 45 degrees F), use heated water and aggregates if necessary to maintain concrete temperature between 60 degrees F and 90 degrees F.
- B. Add water in accordance with ACI 304R, add at one time only, not more than 2 gal/cu yd of concrete, and provided the increase in slump does not exceed one inch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this Section.

3.02 PREPARATION

- A. Verify that forms are clean and free of rust before applying release agent.

3.03 INSTALLATION - VAPOR RETARDER

- A. Install vapor retarder under interior slabs on grade according to manufacturer's instructions and ASTM E1643. Lap joints minimum 6 inches and seal watertight by taping edges and ends.
 1. Vapor Retarder Over Granular Fill: Install granular fill as specified in Section 31 2300 before placing vapor retarder. Do not use sand.
 2. Fine grade under slab soils to smooth and level surface prior to installation of slab on grade edge and construction joint forms.
 3. Tamp and level subbase soil materials to within plus zero (0) inches to minus 3/4 inches from required subgrade elevation.
 4. Lap vapor retarder up and over foundation elements and terminate edges of vapor retarder at top level of concrete slab; seal to foundation elements and other perimeter elements using materials and methods that will result in continuous seals that have same or better perm rating as specified for vapor retarder.
 5. Seal all penetrations, including pipes, with specified pipe boots; no penetrations of vapor retarder membrane are permitted except for reinforcing steel and permanent utilities.
 6. Do not disturb or damage vapor retarder while placing concrete. Repair damaged vapor retarder by cutting patches of vapor retarder, overlapping damaged area 6 inches minimum and taping all four sides with vapor retarder manufacturer's approved seal tape.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- D. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- F. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding, and tamping according to ACI 309R. Vibration of forms and reinforcing is not permitted.
- G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified in this Section.

3.05 SLAB JOINTING

- A. Locate joints as indicated on Drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
 - 2. Separate piping, conduit, and similar penetrations through slabs on grade to allow free vertical movement of slab or penetrating element.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
- E. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for conformance to specified tolerances.
- B. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
- C. Corrective Measures:
 - 1. Correct the slab surface if tolerances are less than specified.
 - 2. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height unless otherwise specified. Provide finish as follows:
 - 1. Remove all fins, projections, and other detrimental irregularities on surfaces to receive waterproofing systems; comply with waterproofing system manufacturer's requirements for surface preparation.
- D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Surfaces to Receive Adhesive-Applied Floor Coverings: "Steel trowel," non-burnished and free of ridges, as described in ACI 301.1R; adhesive-applied floor coverings include carpeting, resilient flooring, seamless flooring, thin set ceramic tile, and other specified flooring systems.
 - 2. Surfaces to Receive Standard Broom Finish: Immediately after float finishing, slightly roughen surface by brooming with fiber-bristle broom perpendicular to main traffic route, or as directed by Architect. Coordinate required final finish with Architect before application.
 - 3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal Concrete: Not less than 7 days.

- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Curing - Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. Unless approved otherwise in writing by Architect and accepted flooring manufacturers, cure slabs and floors to receive adhesive-applied flooring using one of the following methods:
 - a. Cure slabs using specified moisture emission reducing curing compound; application method and rate in strict conformance with curing compound manufacturer's requirements to maintain specified warranty.
 - 2. Curing - Slabs and Floors Not Receiving Adhesive-Applied Flooring: Begin after initial curing but before surface is dry.
 - a. Curing Compound: Apply specified curing compound in two coats at right angles, using application rate recommended by manufacturer.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
 - 1. Test one cylinder at 7 days and two cylinders at 28 days; retain one cylinder for 56 day test. Discard 56 day cylinder if 28 day cylinder tests indicate compliance with specified concrete strength; otherwise, test 56 day cylinder.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.
- H. Sample concrete used for each set of test cylinders for air content, temperature, and unit weight.
- I. Reinforcing: Inspected by testing agency prior to closing formwork or placing concrete.
- J. Special inspection is required for post-installed anchors.

3.10 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.
- D. Repair interior and exterior slab and wall cracks, holes, and voids exceeding 1/16 inch wide by grinding crack to 1/8 inch wide and fill with epoxy bonding system. Grind smooth and flush with adjacent surface.
 - 1. Holes and Voids: Epoxy resin.
 - 2. Cracks: Epoxy filler.

3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Calcium silicate masonry units.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Accessories.

1.02 REFERENCE STANDARDS

- A. ACI 315 - Details and Detailing of Concrete Reinforcement.
- B. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- G. ASTM C73 - Standard Specification for Calcium Silicate Brick (Sand-Lime Brick).
- H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- I. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.
- J. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- K. ASTM C150/C150M - Standard Specification for Portland Cement.
- L. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- M. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- O. ASTM C476 - Standard Specification for Grout for Masonry.
- P. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- Q. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene meeting one week before starting work of this Section.
 - 1. Convene under general provisions of Section 01 7000.
 - 2. Require attendance by all relevant installers.
 - 3. Require attendance of parties directly affecting work of this Section.
 - 4. Review conditions of installation, installation procedures, and coordination with related work.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS (CMU)

- A. Acceptable Manufacturers:
 - 1. Manufacturers for each product as specified in this Section.
 - 2. Substitutions: See Section 01 6000 - Product requirements.
- B. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.
 - 2. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on the Drawings for specific locations.
 - 3. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
 - 4. Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block, as indicated.
 - b. Exposed Faces: Manufacturer's standard gray color and texture.

2.02 CALCIUM SILICATE MASONRY UNITS (SMU)

- A. Calcium Silicate Masonry Units: ASTM C73, Grade SW; solid units that have been pressure formed and autoclaved.
 - 1. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
 - 2. Size: Standard units with nominal face dimensions as indicated on Drawings and nominal depth of 4 inches (3-5/8 inch actual).
 - 3. Colors as scheduled on Drawings.
 - 4. Basis of Design Manufacturer: Arriscraft International, Inc.: www.arriscraft.com.
 - a. Substitutions: Not permitted.

2.03 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I.
 - 1. Not more than 0.60 percent alkali.
 - 2. Hydrated Lime: ASTM C207, Type S.
 - 3. Mortar Aggregate: ASTM C144.
 - 4. Grout Aggregate: ASTM C404.
- B. Water: Clean and potable.
- C. Admixtures: Not permitted unless specified, or requested by Contractor in writing and approved in writing by Architect.

2.04 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; galvanized.
- B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

- C. Single Wythe Joint Reinforcement: Truss type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
- D. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A153/A153M, Class B, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in; self-sealing head flange.
 - 1. Acceptable Product:
 - a. Wire-Bond; Sure-Tie or Tapcon Sure-Tie: www.wirebond.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A153/A153M, Class B.
 - 1. Anchor Plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire Ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 3. Vertical Adjustment: Not less than 3-1/2 inches.

2.05 FLASHINGS

- A. Rubberized Asphalt Flashing System: Self-adhering polymer modified asphalt sheet; 40 mils (0.040 inch) minimum total thickness; with cross laminated polyethylene top and bottom surfaces.
 - 1. Provide with manufacturer's integral PVC or stainless steel termination bar, Kynar-coated galvanized steel sheet metal drip edge; color selected by Architect.
 - 2. Drainage Mat: Integral, recycled polyester mesh, open drainage mat and mortar guard continuously connected to mesh weep tabs spaced approximately 6 inches on center; mold-, rot-, and oxidation-resistant, minimum 90 percent open.
 - 3. Accessory Components: Premolded, minimum 14 inch high end dams and corner boot flashing accessories.
 - 4. Lap and Termination Bar Sealant: System manufacturer's recommended product compatible with other system materials and components.
 - 5. Acceptable Manufacturers:
 - a. Mortar Net Solutions; Total Flash System: www.mortarnet.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORIES

- A. Weather Barrier: Specified in Section 07 2500.
- B. Weeps and Cavity Vents: Molded PVC grilles, insect resistant.
 - 1. Width: Match specified mortar joint thickness; 3/8 inch, unless otherwise indicated.
 - 2. Height: Match height of applicable masonry unit, plus 3/8 inch.
 - 3. Depth: Match depth of applicable masonry unit, plus 1/4 inch.
- C. Sealants: Types required by flashing manufacturer to suit indicated installation and service conditions.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
 - 1. Acceptable Product:

2.07 LINTELS

- A. Steel Lintels: Specified in Section 05 5000.

2.08 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C270, using the Property Specification.

1. Mortar and Grout for Calcium Silicate Masonry: 1:1:6 Portland cement:hydrated lime:sand mix by volume for both cementitious materials and aggregate, as required by specified masonry manufacturer.
 2. Masonry Below Grade in Contact With Earth: Type S.
 3. Exterior Loadbearing Masonry: Type N.
 4. Exterior Non-loadbearing Masonry: Type N.
 5. Interior Loadbearing Masonry: Type N.
 6. Interior Non-loadbearing Masonry: Type O.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other Sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Verify that weather barrier is installed according to Section 07 2500.

3.02 PREPARATION

- A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 1. Bond: Running.
 2. Coursing: One unit and one mortar joint to equal 8 inches.
 3. Mortar Joints: Concave.
- D. Calcium Silicate Masonry Units:
 1. Bond and Coursing: As indicated for different locations.
 2. Mortar Joints: Concave.

3.05 PLACING AND BONDING

- A. Lay hollow masonry units with face shell bedding on head and bed joints.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at maximum 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls, and rowlock/belt courses where indicated.

3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Unless otherwise indicated on Drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 12 inches.

3.09 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

- A. Install horizontal joint reinforcement 8 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 12 inches.

3.10 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.11 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up at least 8 inches, minimum, to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.

3.12 LINTELS

- A. Install loose steel lintels over openings.
- B. Maintain minimum 4 inch bearing on each side of opening.

3.13 GROUTED COMPONENTS

- A. Reinforce bond beams as indicated on Drawings.
- B. Lap splices as detailed on Drawings.

- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches both sides of opening.

3.14 CONTROL AND EXPANSION JOINTS

- A. Size control joints as indicated on Drawings; if not shown, 3/8 inch wide.
 - 1. Provide sealed expansion joint at all internal corners of only non-structural masonry veneer, whether or not specifically noted or detailed.
- B. Do not continue horizontal joint reinforcement through control or expansion joints.

3.15 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other Sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.16 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/8 inch, plus 1/8 inch.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.17 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other Sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.18 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for conformance to requirements of this specification.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.19 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with specified cleaning solution, at low pressure or by hand methods only; do not introduce excessive moisture into masonry wall surfaces during cleaning operations.
- D. Use non-metallic tools and stiff brushes in cleaning operations.

3.20 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
 - 1. Install required protection of installed work at the end of each work day.

END OF SECTION

SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing.
- B. Grouting under base plates and other bearing members.

1.02 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual.
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges.
- C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- E. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.
- F. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel.
- G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- J. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- K. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric].
- L. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- M. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
- N. ASTM C230/C230M - Flow Table for Use in Tests of Hydraulic Cement.
- O. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- P. ASTM E94 - Standard Guide for Radiographic Examination.
- Q. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.
- R. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry.
- S. ASTM E709 - Standard Guide for Magnetic Particle Testing.
- T. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- U. ASTM F1852 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- V. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- W. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- X. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.
- Y. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections.
- Z. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- AA. SSPC-SP 2 - Hand Tool Cleaning.
- AB. SSPC-SP 6 - Commercial Blast Cleaning.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate cambers and loads.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
 - 5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts; identify pretensioned and slip-critical high-strength bolted connections.
- C. Design Calculations: Submit calculations for the following:
 - 1. Connections not completely detailed or not indicated on Drawings.
 - 2. Request for substitution of member sizes, material grades, or any modification of the strength or configuration of the structural framing requested for the Contractor's convenience, erection sequence, construction equipment, and materials.
 - 3. Calculations: Conform to specified reference standards and clearly demonstrate applicability for intended use.
- D. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Fabricator: Company specializing in performing the work of this Section with minimum five years of documented experience.
- C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- D. Erector: Company specializing in performing the work of this Section with minimum five years of documented experience.

1.05 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 corrosion and deterioration.
 - 1. 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.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Angles, Plates, Channels, S Shapes, M Shapes, and HP Shapes: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.

- C. Rolled Steel Structural Shapes: ASTM A992/A992M.
- D. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.
- E. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
- F. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.
- G. Steel Bars: ASTM A108.
- H. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.
 - 1. Cold finished carbon steel, minimum tensile strength of 60,000 psi, minimum yield strength of 50,000 psi; dimensions complying with AISC Specifications.
- I. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- J. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436 washers.
- K. Headed Anchor Rods: ASTM A 307, Grade C, plain.
- L. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- M. Non-Shrink Grout: ASTM C1107/C1107M, Grade B; pre-mixed compound consisting of non-metallic aggregate, cement, and manufacturer's specified water reducing and plasticizing agents; non-staining, non-gas-forming, containing no chlorides; plastic consistency as measured according to ASTM C230/C230M; capable of developing minimum compressive strength of 10,000 psi in 28 days.
- N. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fabricate structural steel members in accordance with AISC S303 specifications.
- B. Shop fabricate to greatest extent possible.
- C. Account for distortion and shrinkage due to welding processes as part of detailing and fabrication procedures, both in the shop and in the field.
- D. Provide connections as shown or noted on Drawings; if not shown or noted, provide Standard Framed Beam Connections as shown in AISC (MAN).
 - 1. Combination of bolts and welds to transmit stress in the same faying surface of any connection is not permitted.
 - 2. Provide welded or bolted shop connectors using high-strength bolts.
 - 3. Field Connections: Bolt field connections, except where welded connections are specifically indicated.
 - a. Provide high-strength bolts for principal connections including all beam-to-beam and all beam-to-column connections.
 - b. Provide high-strength or unfinished bolts for connections of secondary framing members including girts and other framing members taking only nominal stresses.
- E. Mark all members in protected, plainly visible locations in accordance with reference numbers on setting diagrams. Determine and mark the member work point at each end of columns in the shop with a center punch or other acceptable means. Place marking on the flanges and web at each end of columns. Define work point in accordance with AISC (MAN).
- F. Finish work as specified and indicated on Drawings, true and free from twists, kinks, buckles, open joints, and other defects.
- G. Perform necessary cutting, fitting, and drilling to accommodate other trades, and secure correct information from other trades before and after steel is delivered. Cutting or drilling will not be permitted on the site without approval of Architect.

- H. Completely assemble and weld sub-assemblies with milled surfaces before welding.
- I. Welding: Comply with AISC specifications and AWS standards. Provide 3/16 inch continuous fillet welds, but not less than AISC minimum based on thickness of parts joined for welds not specified.
- J. Splices: Splicing of members to obtain the required lengths is not permitted without prior approval of Architect, unless specifically detailed on Drawings.
- K. Cambering: Provide cambered beams and girders where indicated on Drawings; in-place camber tolerance plus 3/8 inch, minus 0 inch maximum.
- L. Substitutions: Where exact sizes and weights specified are not readily available, secure Architect's acceptance of suitable sizes in sufficient time to prevent delay due to substitutions.
- M. Shear Stud Connectors: Automatically end weld according to AWS D1.1/D1.1M. Shop weld where possible. Thoroughly clean surface where stud is to be attached; remove mill scale by grinding or sandblasting where it is sufficiently thick to interfere with proper welding. At metal deck, field install by welding through deck. Clean metal deck surface where studs are to be attached.

2.03 FINISH

- A. Prepare structural component surfaces in accordance with SSPC-SP 2.
- B. Clean and prepare structural steel surfaces before priming in accordance with SSPC-SP 6 for non-galvanized members and SSPC-SP 16 for galvanized members. .
- C. Shop prime structural steel members unless otherwise indicated; do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
 - 1. Immediately after surface preparation, apply primer paint at a rate to provide uniform dry film thickness of 1.0 mils.

2.04 SOURCE QUALITY CONTROL

- A. Shop Inspection: For all columns and 50 percent of beams and girders, examination of steel for straightness and alignment, conformance to length tolerances, fissures, mill scale, and other defects and deformities as described in ASTM A6/A6M, and examination of fabricated pieces for conformity with approved shop drawings.
- B. Welded Connections: Visually inspect all shop-welded connections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with applicable AISC S303 requirements.
- B. Align the various members forming a complete frame or structure after assembly and adjust accurately before fastening.
- C. Measure and adjust for distortion and shrinkage of field welded assemblies as erection proceeds.
- D. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- E. Clean bearing surfaces for base plates and roughen to improve bond. Clean bottom surface of base plates.
- F. Set base, bearing plates, and leveling plates level and at correct elevations. Temporarily support on steel wedges or shims until supported members are plumbed and grouting is completed. Tighten anchor bolts after supported members have been positioned and plumbed. Cut protruding bearing pads or shims back flush with edge of base plates prior to grouting.

- G. Field weld components and shear studs indicated on Drawings.
- H. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on Drawings. Install high-strength bolts in accordance with AISC S348.
- I. Provide bolts of sufficient length to allow at least two full threads beyond nut after tightening.
- J. Provide bearing-type connections, with threads excluded from shear planes, unless otherwise shown or indicated.
- K. Provide slip critical type connections where shown on Drawings, complying with AISC S348.
- L. Install lock nuts on slip connections and nick threads or tack weld nuts.
- M. Where bolts will be exposed-to-view, space at regular intervals, in uniform patterns.
- N. High-Strength Bolts: Install high-strength bolts using types and grades as specified for type of bolt and type of joint indicated on Drawings.
 - 1. Joint Types: Provide snug tightened, pretensioned, and slip critical joints.
- O. Do not field cut or alter structural members without approval of Architect.
- P. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- Q. After erection, touch-up primer on welds, abrasions, and surfaces shop primed or galvanized, except surfaces to be in contact with concrete.
- R. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for non-shrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

- A. Comply with requirements of Chapter 10 of AISC S303. Measure conformance at mean operating temperature of 70 degrees F. Compensate for difference in temperature at time of erection.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Inspect in accordance with AISC (MAN).
- C. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT), testing at least 10 percent of bolts at each connection.
- D. Field Inspection: Assure that the work conforms to specified requirements, and include:
 - 1. Inspection of field welding.
 - 2. Verification of proper fit and alignment.
 - 3. Verification that Contractor's erection procedures adequately correct for distortion and shrinkage in field welded assemblies and connections. Measure weld shrinkage at all groove welded column splices. Submit reports of measurements to the Architect within two days of completion of welding.
- E. Welding Inspection: Assure that the work conforms to specified requirements, and include:
 - 1. Verification that electrodes used for manual shielded metal-arc welding and the electrodes and flux used for submerged arc welding conform to specified requirements.
 - 2. Verification that the approved welding procedure and the approved welding sequence are followed without deviation, unless specific approval for change is obtained from the Architect.
 - 3. Visual inspection on 100 percent of fillet welds.
- F. Shear Stud Connectors:
 - 1. Weld a minimum of 2 shear connectors at the start of each production period in order to determine proper generator, control unit, and shear connector welder setting. Shear connectors must be capable of being bent 45 degrees from vertical without weld failure.

2. If, after welding, visual inspection reveals that a sound weld or a full 360 degree fillet has not been obtained for a particular shear connector, bend connector to 15 degrees. If no fracture occurs, stud is considered acceptable and left bent. Replace shear connectors failing this test.
 3. Test studs acoustically by striking each one with hammer. Bend each stud to 15 degrees that does not ring when struck. If no fracture occurs, stud is considered acceptable and left bent. Replace shear connectors failing this test.
 4. Additional Testing: Test not less than one of each 100 studs by bending 15 degrees. If no fracture occurs, stud is considered acceptable and left bent. Replace shear connectors failing this test.
 5. If the number of rejected studs exceeds 3 percent of the total number of studs tested, perform additional testing on one of each 25 studs by bending to 15 degrees. Continue increased frequency of testing until the number of rejected studs is less than 3 percent of the total number of studs tested.
 6. Do not weld shear connectors when precipitation is occurring and the moisture cannot be prevented from accumulating on connection surfaces.
- G. Welded Connections: Visually inspect all field-welded connections and test at least 20 percent of welds using one of the following:
1. Radiographic testing performed in accordance with ASTM E94; minimum quality level 2-2T.
 2. Ultrasonic testing performed in accordance with ASTM E164.
 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 4. Magnetic particle inspection performed in accordance with ASTM E709; performed on root pass and finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
 5. Correct deficiencies in structural steel work which inspection and test reports indicate non-compliance with specified requirements. Perform additional tests, at Contractor's expense, as necessary until compliance is achieved.

3.05 CLEANING

- A. Clean erected structural steel members of field-applied markings, soil, and mud in accordance with Section 01 7000.

END OF SECTION

SECTION 05 2100 - STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Open web steel joists, with bridging, attached seats and anchors.
- B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.
- C. Supplementary framing for floor and roof openings greater than 18 inches.
- D. Design engineering for steel joists.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- D. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- E. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric].
- F. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- G. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- H. ASTM F436 - Standard Specification for Hardened Steel Washers.
- I. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- K. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.
- L. SJI (SPEC) - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders.
- M. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders.
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- O. SSPC-SP 2 - Hand Tool Cleaning.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments as applicable.
 - 1. Indicate quantity and layout of headed stud shear connectors on composite joist members.
- C. In addition to shop drawings, submit the following for information only, prior to the erection of joists:
 - 1. One set of design calculations for joists and joist girders, which demonstrate compliance with SJI (SPEC), and with specified requirements.
 - 2. Special joists requiring modification by manufacturer to support non-uniform, unequal, or special loading conditions that invalidate load tables in SJI (SPEC).
 - 3. Submit supplemental calculations for the following:
 - a. Connections not completely detailed or not indicated on the structural Drawings.
 - b. Request for substitution of member sizes, material grades, or any modification of the strength or configuration of the structural framing requested for the Contractor's convenience, erection sequence, construction equipment, and materials.

- c. Calculations: Conform to specified reference standards and clearly demonstrate applicability for intended use.
- D. Product Data: Manufacturer's specifications and installation instructions for each type of joist and accessory. Include manufacturer's certification that joists comply with AISC-SJI Specifications. Submit manufacturer's data for primer paint indicating compliance with specified formulation and performance.
- E. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.
- F. Manufacturer's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

- A. Design joists, and connections not detailed on the Drawings, under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Colorado.
- B. Perform Work, including that for headers and other supplementary framing, in accordance with SJI (SPEC) Standard Specifications Load Tables and SJI Technical Digest No. 9.
 - 1. Maintain one copy of document on site.
- C. Manufacturer Qualifications: Company specializing in performing the work of this Section with minimum five years documented experience.
- D. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- E. Erector Qualifications: Company specializing in performing the work of this Section with minimum five years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Canam Group Inc.: www.canam-steeljoists.ws.
 - 2. New Millenium Building Systems: www.newmill.com.
 - 3. Nucor-Vulcraft Group: www.vulcraft.com.

2.02 DESIGN REQUIREMENTS

- A. Design Floor Loads: Specified on Drawings.
- B. Design Roof Loads: Specified on Drawings.
- C. Minimum Joist Opening to Accommodate Mechanical Ducts: As indicated on Drawings.

2.03 MATERIALS

- A. Open Web Joists: Types as indicated on Drawings.
 - 1. Minimum End Bearing on Steel Supports: Comply with referenced SJI standard.
 - 2. Finish: Shop primed.
- B. Anchor Bolts, Nuts and Washers: ASTM A307, hot-dip galvanized per ASTM A153/A153M, Class C.
- C. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436 washers.
- D. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.
- E. Bridging: As required by SJI (SPEC).
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.04 FABRICATION

- A. Drill holes in chords for attachment of wood nailers where indicated.
- B. Frame special sized openings in joist web framing as detailed.
- C. Provide joist chord extensions indicated. Design for minimum load carrying capacity of joists, or as indicated on Drawings.
- D. Provide horizontal and diagonal bridging as required by SJI (SPEC).
- E. Provide header units to support tail joists at openings in floor or roof system not framed with structural steel shapes.

2.05 FINISH

- A. Shop prime joists as specified.
 - 1. Do not prime surfaces that will be fireproofed, field welded, or in contact with concrete.
- B. Prepare surfaces to be finished in accordance with SSPC-SP 2.
- C. Immediately after surface preparation, apply primer paint at a rate to provide uniform dry film thickness of 1.0 mils. Provide full coverage of joints, corners, edges, and exposed surfaces.

2.06 SOURCE QUALITY CONTROL

- A. Shop Inspection: For all joists, examination for straightness and alignment, conformance to length tolerances, fissures, mill scale, and other defects and deformities as described in ASTM A6/A6M, and examination of fabricated pieces for conformity with approved shop drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.02 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.
- D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
- E. Position and field weld joist chord extensions and wall attachments as detailed.
- F. Install supplementary framing for floor and roof openings greater than 18 inches.
- G. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- H. Do not field cut or alter structural members without approval of joist manufacturer.
- I. After erection, prime welds, damaged shop primer, damaged galvanizing, and surfaces not shop primed, except surfaces specified not to be primed.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Perform field testing under provisions of Section 05 1200.

3.05 CLEANING

- A. Clean erected steel joist members of field-applied markings, soil, and mud in accordance with Section 01 7000.

END OF SECTION

SECTION 05 3100 - STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof deck.
- B. Supplementary framing for openings up to and including 18 inches.
- C. Bearing plates and angles.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- C. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- D. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.
- E. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.
- F. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks.
- G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- D. Certificates: Certify that products furnished meet or exceed specified requirements.
- E. Submit manufacturer's installation instructions.
- F. Welders Certificates: Certify welders employed on the work, verifying AWS qualification within the previous 12 months.
- G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers - Steel Decking:
 - 1. New Millenium Building Systems: www.newmill.com.
 - 2. Nucor-Vulcraft Group: www.vulcraft.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STEEL DECK

- A. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
 - 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
 - 3. Structural Properties and Profiles: As indicated on Drawings.

2.03 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
- B. Welding Materials: AWS D1.1/D1.1M.
- C. Fasteners: Galvanized hardened steel, self tapping.
- D. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
- E. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- F. Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- G. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.04 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gage, 0.0299 inch thick sheet steel; of profile and size as indicated; finished same as deck.
- B. Roof Sump Pans: Formed sheet steel, 14 gage, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. Fasten deck to steel support members at ends and intermediate supports at center-to-center spacing as indicated on Drawings, parallel with the deck flute and at each transverse flute using methods specified.
- C. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.
- D. Weld deck in accordance with AWS D1.3/D1.3M.
- E. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- F. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- G. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- H. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.03 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. Perform field testing under provisions of Section 05 1200.

END OF SECTION

SECTION 05 4000 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formed steel stud exterior wall framing.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- C. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- D. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate with work of other Sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations and other pertinent data.
 - 1. Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this Section, and with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. CEMCO: www.cemcosteel.com.
 - 2. ClarkDietrich Building Systems: www.clarkdietrich.com.
 - 3. The Steel Network, Inc.: www.SteelNetwork.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Acceptable Manufacturers - Framing Connectors and Accessories:
 - 1. Same manufacturer as metal framing.

2.02 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

2.03 FRAMING MATERIALS

- A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.

1. Gage and Depth: As indicated on the Drawings.
2. Painted finish.
3. Provide components fabricated from ASTM A1008/A1008M, Designation SS (structural steel).

2.04 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Plates, Gussets, Clips: Formed Sheet Steel, thickness determined for conditions encountered; finish to match framing components.
- C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.05 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
- B. Anchorage Devices: Powder actuated.
- C. Welding: In conformance with AWS D1.1/D1.1M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.
- B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.
- C. Place studs at 16 inches on center unless otherwise indicated on Drawings; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener or welding method as indicated.
- D. Construct corners using minimum of three studs.
- E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.
- F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
- G. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- H. Blocking and Supplemental Fixture and Equipment Support:
 1. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from supported item.
- I. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- J. Touch-up field welds and damaged primed surfaces with primer.

3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/4 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.
- C. Maximum Variation from Plumb and Level: 1/4 inch in 10 feet, non-cumulative.

END OF SECTION

SECTION 05 5000 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- J. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- K. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric).
- L. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
- M. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric).
- N. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- O. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- P. ASTM C230/C230M - Flow Table for Use in Tests of Hydraulic Cement.
- Q. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- S. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- T. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- U. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- V. SSPC-SP 2 - Hand Tool Cleaning.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design railing systems under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Colorado.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- F. Slotted Channel Fittings: ASTM A1011/A1011M.
- G. Fasteners: As detailed or required for indicated applications.
- H. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.
- C. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.
- D. Bolts, Nuts, and Washers: Stainless steel.
- E. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

- A. Provide and install items shown on Drawings with anchorage and attachments necessary for installation.
- B. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
 1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
 2. Rungs: One inch diameter solid round bar spaced 12 inches on center; corrugated, dimpled, kerfed, or coated for slip-resistance.

3. Space rungs 7 inches from wall surface.
- C. Bollards: Nominal 6 inch diameter, standard steel pipe, minimum wall thickness 0.280 inches; concrete filled, crowned cap, as detailed; finish as specified.
 1. Color: Paint Safety Yellow or as specified by Owner requirements.
- D. Lintels: As detailed; prime paint finish.
- E. Embed Plates: Fabricate embed plates for casting into concrete, and masonry construction as detailed on Drawings. Weld anchors to plates to provide full transfer of design loads and stresses. Test embed plate assemblies prior to installation under provisions of Section 05 1200.
- F. Firestopping Sleeves: Comply with requirements of Section 8400, and supply to that Section for installation; unfinished.

2.05 ACCESSORIES

- A. Non-Shrink Grout: ASTM C1107/C1107M, Grade B; pre-mixed compound consisting of non-metallic aggregate, cement, and manufacturer's specified water reducing and plasticizing agents; non-staining, non-gas-forming, containing no chlorides; plastic consistency as measured according to ASTM C230/C230M; capable of developing minimum compressive strength of 10,000 psi in 28 days.

2.06 FINISHES - STEEL

- A. General:
 1. Prepare surfaces to be primed in accordance with SSPC-SP 2, or as recommended by finish coating manufacturer.
 2. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Prime paint all steel items, unless otherwise specified.
 1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
 2. Prime Painting: One coat.

2.07 FINISHES - ALUMINUM

- A. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.

2.08 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Drawings.

- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof-mounted curbs.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Miscellaneous framing and sheathing.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood.
- D. PS 1 - Structural Plywood.
- E. PS 20 - American Softwood Lumber Standard.
- F. WWPA G-5 - Western Lumber Grading Rules.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate installation of rough carpentry members specified in other Sections.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch or Hem-Fir, unless otherwise indicated.
 - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Western Wood Products Association; WWPA G-5.
- B. Sizes: Nominal sizes as indicated on Drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Wood Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Blocking Applications:
 - 1. Plywood Blocking/Nailers - Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 2. Plywood Blocking/Nailers - Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

- A. Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
 - 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

2.05 FACTORY WOOD TREATMENT - GENERAL

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements, and also stamped "Kiln Dried After Treatment" ("KDAT").
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards, and also stamped "Kiln Dried After Treatment" ("KDAT").

2.06 FIRE RETARDANT TREATMENT (FRT)

- A. Interior Type: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - 1. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - 2. Applications:
 - a. Treat all interior rough carpentry items.

2.07 PRESERVATIVE TREATMENT (PT)

- A. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - 1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - 2. Applications:
 - a. Treat lumber in contact with roofing, flashing, or waterproofing.
 - b. Treat lumber in contact with masonry or concrete.
 - c. Treat lumber less than 18 inches above grade.
 - d. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.03 ROOF-RELATED CARPENTRY

- A. Provide wood curb at all roof openings except _____ where specifically indicated otherwise. Form corners by alternating lapping side members.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size: 48 by 96 inches, installed horizontally at ceiling height.
 - 5. Size and Location: As indicated on Drawings.

3.05 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

3.06 CLEANING

- A. Waste Disposal:
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, or similar waste on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 07 1113 - BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bituminous dampproofing.
- B. Protection boards.

1.02 REFERENCE STANDARDS

- A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- B. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
- C. NRCA (WM) - The NRCA Waterproofing Manual.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this Section with at least three years of documented experience and approved by manufacturer.

1.05 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Karnak Corporation: www.karnakcorp.com.
 - 2. Mar-Flex Systems, Inc.: www.mar-flex.com/sle.
 - 3. W.R. Meadows, Inc.: www.wrmeadows.com/sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BITUMINOUS DAMPPROOFING - COLD-APPLIED

- A. Bituminous Dampproofing: Cold-applied, water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
 - 1. Composition - Vertical Application: ASTM D1227 Type III or ASTM D1187/D1187M Type I.
 - 2. Composition - Horizontal and Low-Slope Application: ASTM D1227 Type II or III.
 - 3. VOC Content: Not more than permitted by local, State, and federal regulations.
 - 4. Applied Thickness: 1/16 inch, minimum, wet film.
- B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

2.03 ACCESSORIES

- A. Protection Board: Rigid insulation specified in Section 07 2100.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.02 APPLICATION

- A. Foundation Walls: Apply two coats of dampproofing.
- B. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- C. Apply bitumen with mop.
- D. Apply from 2 inches below finish grade elevation down to top of footings.
- E. Seal items watertight with mastic, that project through dampproofing surface.
- F. Place protection board directly over dampproofing, butt joints, and adhere to tacky dampproofing.
- G. Scribe and cut boards around projections, penetrations, and interruptions.

END OF SECTION

SECTION 07 2100 - THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at perimeter foundation wall.
- B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.
- D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
- E. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.04 QUALITY ASSURANCE

- A. Thicknesses specified are for the thermal conductivity (k-value at 75 degrees F) specified for each material. Provide adjusted thicknesses for approved use of substituted materials with different thermal conductivity ratings. Where insulation is specified to have a specific "R" value, furnish manufacturer's standard thickness required to equal or exceed the specified value.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Do not allow insulation materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation.
- B. Protect plastic insulation from exposure to direct sunlight.
- C. Do not deliver plastic insulation materials to the project site ahead of time of installation. Protect at all times against ignition. Complete the installation and concealment of plastic materials as soon as possible in each area of work.

1.06 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation at Perimeter of Foundation: Expanded polystyrene board.
- B. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
- C. Insulation Over Roof Deck: Polyisocyanurate board.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: Extruded polystyrene board; with either natural skin or cut cell surfaces, and the following characteristics:
 - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 3. R-value; 1 inch of material at 72 degrees F: 5, minimum.
 - 4. Board Size: 48 x 96 inch.
 - 5. Board Thickness: As indicated on Drawings.
 - 6. Board Edges: Square.
 - 7. Compressive Resistance: 25 psi.
 - 8. Board Density: 1.60 lb/cu ft.
 - 9. Water Absorption - Maximum: 0.3 percent, by volume.

2.03 BATT INSULATION MATERIALS

- A. Glass Fiber Batt Insulation With Integral Vapor Retarder: Flexible preformed batt or blanket, complying with ASTM C665; integral, self-extinguishing vapor retarder fabric lining.
 - 1. Applications: Pre-engineered metal building assemblies.
 - 2. Complies with fire-resistance requirements specified; tested for compliance in accordance with NFPA 701, large scale.
 - 3. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 4. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
 - 5. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
 - 6. Formaldehyde Content: Zero.
 - 7. Thermal Resistance: As noted on Drawings, minimum value.
 - 8. Thickness: Full thickness of framing or cavity space indicated, unless otherwise specifically noted on Drawings.
 - 9. Vapor Barrier Liner Fabric: Woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene film, as specified.
 - a. Permeance of Fabric and Seams: 0.025 perms.
 - b. Size and Seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
 - c. Stapled seams not acceptable.
 - d. Factory-folded to allow for rapid pull-out on strap support system.
 - e. Color: White.
 - 10. Acceptable Manufacturer:
 - a. Johns Manville; Simple Saver System: www.jm.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

- A. Tape: Type and composition matching each type of membrane or insulation to be taped; self-adhering, mesh reinforced, 2 inch wide.
- B. Protection Board for Below Grade Insulation: Wood fiberboard, 1/4 inch thick.
- C. Adhesive: Type recommended by insulation manufacturer for indicated applications.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Install boards horizontally on foundation perimeter.

1. Place boards to maximize adhesive contact.
 2. Install in running bond pattern.
 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
1. Apply specified adhesive in five continuous beads per board length.
 2. Install boards horizontally from base of foundation to top of insulation.
 3. Butt boards tightly, with joints staggered from insulation joints.

3.03 BATT INSULATION INSTALLATION

- A. Installation - General:
1. Install insulation and vapor retarder at locations indicated and in accordance with manufacturer's instructions.
 2. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
 3. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
 4. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- B. Metal Stud Framing: Tape insulation batts in place.
- C. Tape seal butt ends, lapped flanges, and tears or cuts in vapor retarder membranes.

3.04 PROTECTION

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

END OF SECTION

SECTION 07 2119 - FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Foamed-in-place insulation.
 - 1. In masonry cavity walls.
 - 2. In exterior wall crevices.
 - 3. In shim spaces at windows, storefront frames, and similar locations.
 - 4. At junctions of dissimilar wall and roof materials.

1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures, substrate preparation requirements, and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

1.05 FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
- B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. BASF Corporation: www.spf.basf.com.
 - 2. Demilec LLC: www.demilec.com.
 - 3. Icynene Inc.: www.icynene.com.
 - 4. NCFI Polyurethanes: www.ncfi.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 - 1. Density In Place: Minimum 2.0 lb/cu ft.; ASTM D1622.
 - 2. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
 - 3. Water Vapor Permeance: Vapor retarder; 2 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.

4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.5 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
8. Acceptable Products:
 - a. Covestro, LLC; EcoBay CC: www.covestro.com/sprayfoam/#sle.
 - b. Demilec LLC; HEATLOK SOY 200 Plus: www.demilec.com/#sle.
 - c. Henry Company; PERMAX 2.0: www.henry.com/#sle.
 - d. Icynene Inc.; Icynene ProSeal Eco MD-R-210: www.icynene.com.
 - e. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
 - f. Rhino Linings Corporation; ThermalGuard CC2: www.rhino linings.com/#sle.
 - g. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

- A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids. Screed away excess foam to produce smooth and uniformly textured exposed surfaces.
- C. Patch damaged areas.
- D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts or void applicable warranties of windows and other opening components.

3.04 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2500 - WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1.03 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- C. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- E. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
- F. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of weather barriers with adjacent flashings and weather barriers for compatibility and continuity of those systems.
 - 2. Coordinate installation of flexible flashing at openings with Sections that specify window, door, and other opening installations.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on system materials and accessory components, material characteristics, performance criteria, limitations, and manufacturer's standard flashing and termination details.
- C. Shop Drawings: Provide drawings of project-specific flashing, termination, and special joint conditions based on manufacturer's standard details; minimum scale 1-1/2 inch equals 1 foot.
- D. Manufacturer's Installation Instructions: Indicate substrate and surface preparation, installation methods, and storage and handling criteria.
- E. Reference Standards: Submit one copy of ASTM E2112 for Architect's use.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of documented experience; approved by primary weather barrier system manufacturer.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. System Compatibility: Assume responsibility for confirming that weather barrier system components are compatible with each other as a system, and also compatible with substrate surfaces with which they will be in contact, including but not limited to wall and sheathing surfaces, opening materials, other flashings and weather barrier materials, and joint sealants.

1.07 MOCK-UP

- A. Comply with general mock-up requirements specified in Section 01 4000.
- B. Mock-up: Install air barrier materials in mock-up specified in Section _____.
 - 1. Locate where directed.
 - 2. Mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.09 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

- A. Air Barrier:
 - 1. On outside surface of sheathing of exterior walls use air barrier coating.

2.02 AIR BARRIER MATERIALS

- A. Air Barrier - Fluid Applied: Vapor permeable, elastomeric waterproofing.
- B. Air Barrier Coating:
 - 1. Air Permeance: 0.001 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
 - 2. Water Vapor Permeance: 18 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
 - 3. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure after application.
 - 4. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
 - 5. VOC Content: Zero.
 - 6. Acceptable Products:
 - a. Substitutions: See Section 01 6000 - Product Requirements.
- C. Air Barrier Membrane:
 - 1. Material: Water-based acrylic.
 - 2. Adhesion to Paper and Glass Mat Faced Sheathing: Sufficient to ensure failure due to delamination of sheathing.
 - 3. Dry Film Thickness: 30 mils (0.030 inch), minimum.
 - 4. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
 - 5. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
 - 6. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
 - 7. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
 - 8. Acceptable Products:
 - a. GCP Applied Technologies; Perm-A-Barrier VPL: www.gcpat.com/#sle.
 - b. Parex USA, Inc.; Parex USA WeatherSeal Trowel-on (without gauging aggregate): www.parexusa.com/sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

- A. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
 - 1. Composition: Any material that meets physical requirements of ASTM D1970/D1970M with exceptions indicated.
 - 2. Thickness: 40 mil, 0.04 inch, nominal; exception from ASTM D1970/D1970M.

- B. Thinners and Cleaners: As recommended by material manufacturer.
- C. Accessory Components: As recommended by primary weather barrier membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this Section.
- B. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
 - 1. Comply with ASTM E2112 for installation of weather barrier materials in conjunction with installation of aluminum storefronts, doors, and louvers.
- B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Shingle weather barrier system membranes over other flashings to provide positive drainage of moisture within the wall assembly.
- D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
- E. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer and as otherwise specified.
 - 2. Use flexible flashing to seal to adjacent construction and to bridge joints according to manufacturer's recommendations and standard flashing and termination details adapted as required to indicated project conditions; lap flashing over separate metal or flexible flashings in shingle fashion to shed water and seal laps.
 - 3. Provide flexible flashing or extra thickness of reinforced coating at all changes in plane, intersections with other weather barriers, flashings, and other components of the weather barrier enclosure.
- F. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flexible flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with flexible flashing at least 4 inches wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flexible flashing at least 9 inches wide, covering entire depth of framing.
 - 4. At head of openings, install flexible flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flexible flashing around penetrating item and seal to weather barrier surface.
 - 7. Masonry Veneer Wall Ties: Seal penetrations through weather barrier membrane with manufacturer's recommended sealant or sealing system.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Do not cover installed weather barriers until required inspections have been completed.
- C. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- D. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 5400 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Mechanically attached system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Flashings.
- D. Roofing stack boots and walkway pads.

1.02 REFERENCE STANDARDS

- A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- B. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
- C. FM DS 1-28 - Wind Design.
- D. NRCA (RM) - The NRCA Roofing Manual.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- F. Specimen Warranty: For approval.
- G. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's certification that installation complies with warranty conditions for waterproof membrane.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.
- C. Protect foam insulation from direct exposure to sunlight.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.
 - 3. Exceptions NOT Permitted:
 - a. Damage due to roof traffic.

- b. Damage due to wind speed greater than 56 mph but less than 90 mph.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Materials:
 - 1. Carlisle Roofing Systems, Inc; Sure-Weld TPO: www.carlisle-syntec.com/#sle.
 - 2. Firestone Building Products, LLC: www.firestonebpco.com.
 - 3. GAF; EverGuard TPO 45 mil: www.gaf.com/#sle.
 - 4. GAF; EverGuard Extreme TPO 50 mil: www.gaf.com/#sle.
 - 5. GenFlex Roofing Systems, LLC: www.genflex.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation:

2.02 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, mechanically fastened, over insulation.
- B. Roofing Assembly Requirements:
- C. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.
 - 1. Minimum 2 layers of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
 - 2. Bottom layer of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, composite, or cellular glass board covered with single layer of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
- D. Acceptable Insulation Types - Tapered Application: _____.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane:
 - 1. Material: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M.
 - 2. Reinforcing: Internal fabric.
 - 3. Thickness: 0.060 inch, minimum.
 - 4. Sheet Width: Factory fabricated into largest sheets possible.
 - 5. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Membrane Fasteners: As recommended and approved by membrane manufacturer.
 - 1. Disc Washers and Screws: As recommended and approved by membrane manufacturer..
- D. Flexible Flashing Material: Same material as membrane.

2.04 INSULATION

- A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type I, aluminum foil both faces; Class 1, non-reinforced foam core and with the following characteristics:
 - 1. Compressive Strength: 20 psi.
 - 2. Board Size: 48 by 96 inch.
 - 3. Board Thickness: 1.5 inch.
 - 4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
 - 5. Thermal Resistance: R-value of as noted on drawings.
 - 6. Board Edges: Square.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Perform work in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.02 INSULATION APPLICATION - UNDER MEMBRANE

- A. Attachment of Insulation:
 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
 2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
- B. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Do not apply more insulation than can be covered with membrane in same day.

3.03 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- D. Mechanical Attachment: Apply membrane and mechanical attachment devices in accordance with manufacturer's instructions.
 1. Install mechanical fasteners at spacing required to comply with specified performance requirements..
- E. At intersections with vertical surfaces:
 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 2. Fully adhere flexible flashing over membrane and up to nailing strips.
 3. Secure flashing to nailing strips at 4 inches on center.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.
- B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.05 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove bituminous markings from finished surfaces.

- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.06 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings and counterflashings.
- B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
- F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- G. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.
- H. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- I. SMACNA (ASMM) - Architectural Sheet Metal Manual.
- J. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; Single Ply Roofing Industry. (ANSI/SPRI ES-1)

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with the work of Section 07 6100; match sheet metal roofing color, texture, and finish for sheet metal flashing and trim items exposed to public view.
 - 2. Coordinate with roofing work for scheduling installation of counterflashing, rain drainage and similar items related to roofing.
 - 3. Coordinate with the work of Section 07 9200 for installation of related sealants.
 - 4. Coordinate with masonry work for flashings built into masonry.
- B. Sequencing: Do not proceed with installation of flashing and sheet metal work until substrate construction, cants, blocking, reglets, and other construction are ready to receive the work of this Section.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 6 x 6 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with 1 requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion. Defective work includes failure of watertightness or seals.
- C. Provide 20 year manufacturer warranty for prefinished sheet metal materials. Warranty shall include degradation of metal finish.

PART 2 PRODUCTS

2.01 SHEET METAL FLASHING AND TRIM ASSEMBLIES

- A. Flashing Assemblies:
 - 1. Capable of withstanding structural movement, thermally induced movement, and exposure to wind and weather without failure or permanent deformation.
 - 2. Physically protect roofing systems, roof accessories, and other building elements and systems from damage that would permit water leakage into building enclosure assemblies under all weather conditions.
- B. Roof Edge Flashing and Coping Assemblies:
 - 1. Pull-Off Resistance: Tested in accordance with SPRI ES-1 RE-1, RE-2, and RE-3 as applicable to positive and negative design wind pressure as defined by applicable code.
 - 2. Capable of withstanding structural movement, thermally induced movement, and exposure to wind and weather without failure or permanent deformation.
 - 3. Physically protect roofing systems, roof accessories, and other building elements and systems from damage that would permit water leakage to building interior under all weather conditions.

2.02 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.
 - 1. Applications: Flashings and counterflashings exposed to public view, and where specifically indicated on Drawings.
 - 2. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 3. Color: As selected by Architect from manufacturer's full colors.
- B. Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; anodized finish of color as selected.
 - 1. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils thick.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats and starter strips of same material as exposed sheet, one gage thickness heavier than exposed sheet, and interlockable with exposed sheet.
 - 1. Provide continuous cleat strips for metal copings and flashings.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- H. Fabricate flashings to allow toe to extend minimum 2 inches over roofing terminations. Return and brake edges.

- I. Roof Equipment Supports: Cover raised bases and equipment supports with specified galvanized steel sheet. Fabricate with one inch riveted and soldered flat seams. Extend counterflashings over roof base flashings 4 inches minimum, and fold back bottom edge 1/2 inch. Where metal is penetrated for bolt or other fastener connections, use 4 lb sheet lead washers 2 inches larger than fastener hole.
 - 1. Comply with SMACNA (ASMM) Figure 4-17.
- J. Formed Metal Copings: Fabricate cross joints between coping sheets with 3/16 inch expansion joint between sheets, and 6 inch wide cover plate formed to profile of coping. Form cross joints in coping according to SMACNA (ASMM). Miter, seam, and seal corners of coping.
 - 1. Comply with SMACNA (ASMM) Figure 3-7A.
- K. Provide for thermal expansion/contraction of all exposed sheet metal work exceeding 15 feet in running length, except as otherwise indicated.
 - 1. Wall Caps, Flashing and Trim: 10 feet maximum spacing, and not closer than 24 inches from corners and intersections.

2.04 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.
- D. Concealed Sealants: Non-curing butyl sealant.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- F. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION - GENERAL

- A. Comply with SMACNA Architectural Sheet Metal Manual.
- B. Cleats and Edge Strips: Secure edges of sheet metal members over 12 inches wide, and at other indicated locations with cleats. Fasten cleats at maximum 12 inches on center unless otherwise indicated. Provide continuous edge strips at eaves and gable ends for attaching exposed terminating edge of copings, gravel stops, or fascias. Provide minimum 1/8 inch butt joints as required to accommodate thermal movement.
- C. Formed Metal Copings: Extend front and back edges of coping down over continuous interlocking edge strip. Terminate rear edge with hemmed and folded edge over roof base flashings, or interlock with adjacent flashings as indicated. Miter, seam, weld, and seal corners.
- D. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- E. Apply plastic cement compound between metal flashings and felt flashings.
- F. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

- G. Seal metal joints watertight.

3.04 INSTALLATION - PRE-FINISHED SHEET METAL

- A. Take special care in the handling and installation to avoid damage to finish.
- B. Remove protective film from each unit after installation.
- C. Touch up minor damage or defects to match factory finish. Replace units which are excessively damaged as determined by Architect.

3.05 INSTALLATION - ALUMINUM

- A. Bed aluminum base members in plastic cement, anchor and seal in accordance with manufacturer's instructions.
- B. Clean exposed surfaces immediately to prevent the start of non-uniform oxidation or electrolytic action.
- C. Apply protective backing paint to concealed surfaces which will be in contact with cementitious materials, dissimilar metals, wood, or other absorptive substrates.

END OF SECTION

SECTION 07 7200 - ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof hatches.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate with installation of roofing system and related flashings for weather tight installation.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this Project. Show dimensioned location and number for each type of roof accessory.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 ROOF HATCHES

- A. Acceptable Manufacturers - Roof Hatches:
 - 1. Acudor Products Inc.: www.acudor.com.
 - 2. Babcock-Davis: www.babcockdavis.com.
 - 3. Bilco Company: www.bilco.com/sle.
 - 4. Dur-Red Products: www.dur-red.com.
 - 5. Milcor, Inc.: www.milcorinc.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Roof Hatches and Smoke Vents, General: Factory-assembled steel frame and cover, complete with operating and release hardware.
 - 1. Style: Provide flat metal covers unless otherwise indicated.
 - 2. Mounting: Provide frames and curbs suitable for mounting on flat roof deck.
 - 3. Thermally Broken Hatches: Added insulation to frame and cover; outer frame and cover thermally isolated from inner frame and cover.
 - 4. Sizes: As indicated on Drawings; single-leaf style unless indicated as double-leaf.
 - 5. For Ladder Access: Single leaf; 30 by 36 inches.
 - 6. Extension Post: Extension post for mounting to top rungs of ladder; Model 1 Ladder Up manufactured by Bilco Co.; www.bilco.com.
 - a. Finish: Powder coated; safety yellow color.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- C. Frames/Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
 - 1. Material: Galvanized steel, 14 gage, 0.0747 inch thick.
 - 2. Finish: Factory prime paint.
 - 3. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
 - 4. Curb Height: 12 inches from finished surface of roof, minimum.
- D. Metal Covers: Flush, insulated, hollow metal construction.
 - 1. Capable of supporting 40 psf live load.

2. Material: Galvanized steel; outer cover 14 gage, 0.0747 inch thick, liner 22 gage, 0.03 inch thick.
 3. Finish: Factory prime paint.
 4. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
 5. Gasket: Neoprene, continuous around cover perimeter.
- E. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
 2. Hinges: Heavy duty pintle type.
 3. Hold open arm with vinyl-coated handle for manual release.
 4. Latch: Upon closing, engage latch automatically and reset manual release.
 5. Manual Release: Pull handle on interior.
 6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.
- B. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.

3.04 ADJUSTING

- A. Adjust hardware for smooth operation.

3.05 CLEANING

- A. Clean installed work to like-new condition.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8400 - FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems, materials, and accessories.
- B. Perimeter fire/smoke barriers.
- C. Fire-resistive joint systems.
- D. Firestopping at electrical junction boxes in fire-rated walls.
- E. Firestopping of all penetrations and interruptions to fire rated assemblies, whether indicated on Drawings or not, and other openings indicated.
- F. Contractor's responsibility for determining required scope of firestopping system work, and for determining applicable tested/listed systems for the entire project, and for securing jurisdictional authority approval of firestopping systems.

1.02 DEFINITIONS

- A. Firestopping: A material or combination of materials used to retain the integrity of fire- and smoke-rated construction by maintaining an effective barrier against the spread of flame, and to impede the passage of smoke, gases, and moisture through penetrations, blank openings, construction joints, and perimeter fire/smoke containment in or adjacent to fire-and smoke-rated wall, floor, ceiling, and other rated construction assemblies.
- B. Assembly: Particular arrangement of materials specific to type of construction described or detailed in referenced UL or other approved design.
- C. Barrier: Time-rated fire walls, smoke barrier walls, time-rated floor/ceiling assemblies, and structural floors.
- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is interrupted.
- E. Membrane Penetration: An opening made through one side of an assembly without passing completely through the assembly.
- F. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, top of wall and ceiling, structural floors or roof decks, and adjacent sections of structural floors.
- G. System: Specific products and applications, classified and numbered by UL or other approved testing agency to close specific barrier penetrations.
- H. Sleeve: Metal fabrication or pipe section extending through thickness of barrier used to permanently guard penetration.
- I. VOC: Volatile organic compound(s).

1.03 REFERENCE STANDARDS

- A. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- C. ASTM E1399 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
- D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops.
- E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

- I. IFC - International Firestop Council Recommended Guidelines for Evaluating Firestop Systems Engineering Judgements.
- J. ITS (DIR) - Directory of Listed Products.
- K. FCIA - Firestop Contractors International Association Manual of Practice.
- L. FM 4991 - Approval Standard for Firestop Contractors.
- M. FM (AG) - FM Approval Guide.
- N. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.
- O. UL (DIR) - Online Certifications Directory.
- P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- Q. UL (FRD) - Fire Resistance Directory.
- R. UL 1479 - Standard for Fire Tests of Through-Penetration Firestops.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate installation of firestopping systems with affected trades and adjacent work.
- B. Sequencing: Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.
 - 1. Do not cover or conceal firestopping installations until Owner's inspection agency and jurisdictional authority have inspected each installation.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Jurisdictional Authority Submittal: Prior to submission to Architect, submit to jurisdictional authority and local fire department complete product data indicating proposed product characteristics, performance characteristics, limitation criteria, and documentation of proposed firestop materials and systems for actual project conditions.
 - 1. Include manufacturer's complete installation instructions and UL Design or other approved testing agency data sheets for each proposed firestop system.
 - 2. Include complete test data forms or jurisdictional acceptance for proposed assemblies not conforming to specific UL Design numbers or other approved testing agency system designs.
 - 3. Submit certificate from authority having jurisdiction indicating approval of materials and systems to be used, with one complete copy, for information only, of the approved jurisdictional authority submittal.
- C. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- D. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
 - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Installer Qualifications: Company specializing in performing the work of this Section and:
 - 1. Trained by the manufacturer.

2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
 - a. With minimum 3 years documented experience installing work of this type.
 - b. Able to show at least 5 satisfactorily completed projects of comparable size and type.
 - c. Licensed by authority having jurisdiction.
- C. Obtain firestop systems for each type and condition of penetration from a single manufacturer; intermixing of system components for each type and condition of penetration by different manufacturers is not permitted.
- D. Listed and tested assemblies and systems must be utilized, if they exist, before alternative systems requiring Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFRR) will be considered. Comply with IFC and FCIA for EJ and EFRR design and submittal requirements.

1.07 REGULATORY REQUIREMENTS

- A. Comply with execution requirements of authority having jurisdiction including, if applicable, the requirement that all firestopping work be performed by a single qualified firm or subcontractor.

1.08 MOCK-UP

- A. Comply with general mock-up requirements specified in Section 01 4000.
- B. Mock-up: Install one firestopping assembly representative of each fire rating design required on project.
 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
 2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.
 3. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.
 4. If accepted, mock-up will represent minimum standard for the work.
 5. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.09 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver materials in original unopened containers identified with manufacturer's brand designation and applicable UL label.
- B. Do not use damaged or expired materials.

1.10 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

1.11 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Include agreement to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, general durability, or apparent deterioration beyond manufacturer's printed limitations for stipulated warranty period from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Hilti, Inc.: www.us.hilti.com.
 2. 3M Fire Protection Products: www.3m.com.
 3. Tremco Sealants and Coatings: www.tremcofirestop.com.
 4. Specified Technologies, Inc.: www.stifirestop.com.
 5. A/D Fire Protection Systems Inc.: www.adfire.com.

6. Pecora Corporation: www.pecora.com.
7. USG: www.usg.com.
8. Grace Construction Products: www.na.graceconstruction.com.
9. Nelson Firestop Products: www.nelsonfirestop.com.
10. RectorSeal: www.rectorseal.com.
11. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRESTOPPING - GENERAL REQUIREMENTS

- A. General: Use firestopping systems which are acceptable for those applications for which they are specifically designed. Use of other UL listed systems is Contractor's Option, subject to compliance with specified performance, regulatory, and quality assurance requirements.
 1. Fire Ratings: See Drawings for required systems and ratings.
 2. Where there is no specific tested and classified firestop system for an indicated condition, obtain from the firestopping system manufacturer an Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) according to IFC and FCIA.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.
- C. Scope: Install firestopping at all locations requiring protected openings where piping, conduit, cables, sleeves, ductwork and similar items penetrate fire-resistive, fire-rated, and smoke assemblies, including but not limited to:
 1. Penetrations through wall, floor, and roof assemblies, including empty openings and openings containing penetrations.
 2. Membrane penetrations where items penetrate one side of the barrier assembly.
 3. Joints between rated assemblies to allow independent movement.
 4. Perimeter barriers between exterior wall assemblies and floor and roof assemblies.
 5. Joints, through-penetrations, and membrane penetrations in smoke-rated assemblies.
- D. Materials: Comply with ASTM E814, UL 1479, and UL 2079 as applicable to achieve indicated fire ratings.
- E. General Characteristics:
 1. Surface Burning: ASTM E84 and UL 723; flame spread less than 25, smoke developed less than 450.
 2. Mold Resistance: Provide firestopping materials with mold and mildew resistance rating of 0 as determined by ASTM G21.
 3. Air Leakage of Perimeter Firestopping Barriers and Penetrations: UL 2079; L-rating less than 2.0 cfm/sf or 5.0 cfm/lf as applicable to the type and location of joint.
 4. Durability and Longevity: Permanent.
 5. Side Effects During Installation: Non-toxic.
 6. Side Effects Under Fire Exposure: Non-toxic.
 7. Long Term Side Effects: None.
- F. Perimeter Fire Containment Firestopping: Use any system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of the floor assembly.
 1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.
 2. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
 3. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
 4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.
- G. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 1. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.

2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
 3. Watertightness: In addition, provide systems that have been tested to show W Rating as indicated.
 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- H. Fire Rated Joint Systems: Integrity and indicated fire-resistance ratings as determined by UL 2079, ASTM E1399 or ASTM E1966.
- I. Fire Rated Construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces and types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.
- J. Smoke Barrier Construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

2.03 MATERIALS

- A. Putty Compound: 100 percent solids intumescent or vinyl-type formulation, free of asbestos, silicones, solvents, halogens, PCB's, and inorganic fibers; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84; paintable, not sensitive to freezing after set.
- B. Sealant Compound: One-part intumescent, endothermic, ablative, or elastomeric acrylic water-based caulking material required by applicable UL Design; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84.
- C. Spray-Applied Compound: Water-based, flexible coating which dries to form a flexible seal; tested in accordance with ASTM E1399, complying with wind sway and thermal category, 500 cycles at minimum 10 cycles/minute.
- D. Foam Compound: Two-part, liquid-silicone elastomer formulated to foam in place when mixed; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84.
- E. Plastic Pipe Device: Intumescent strip material, factory or site fabricated in flexible metal collar with adjustable, screw-tightened stainless steel clamp; UL classified for use with PVC, CPVC, CCPVC, CCABS, PVDF, PP, PB, and FRPP plastic pipe.
- F. Fire-Safing Insulation: ASTM C612, Type I; high-melt mineral fibers and resinous binders formed into blankets, density not less than 4.0 lbs/cu ft, tested for 3-hour fire containment for required depths and dimensions.
- G. Firestopping Pads: Intumescent, dielectric fire putty formed to 7 x 7 or 9.5 x 9.5 inch self-adhering pads, 2-hour fire rating listed by UL.

2.04 ACCESSORIES

- A. Provide necessary accessory materials specified in UL Design to achieve complete firestop system at each penetration. Include collars, sleeves, attachment devices, intumescent materials, and other items required.
- B. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design, and as recommended by firestopping manufacturer for specific substrate surfaces.
- C. Dam Material: Mineral fiberboard, mineral fiber matting, sheet metal, alumina silicate fire board, or other permanent material required as part of the firestopping system, or removable if not specifically required as part of the firestopping system.
- D. Retainers: Impale type clips to support mineral fiber safing blankets.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this Section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing or damming materials required to arrest liquid material leakage.

3.03 INSTALLATION - GENERAL

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.
- C. Apply firestopping materials in sufficient thicknesses to achieve scheduled fire ratings, to uniform density and texture.
- D. Install material at openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
- E. Remove dam material after firestopping material has cured only if dam material is not required as part of the firestopping system; otherwise dam material to remain permanently in place.
- F. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- G. Install labeling required by code.

3.04 INSTALLATION - FIRE SAFING INSULATION

- A. Install safing insulation to completely fill spaces between floor slab edges and spandrel construction as detailed.
- B. Install safing insulation to completely fill voids between floor and roof deck flutes and top of wall construction where wall ratings are indicated.
- C. Install and support safing insulation permanently in position to comply with tested fire assembly and applicable building code requirements.

3.05 INSTALLATION - FIRESTOPPING PADS

- A. Install firestopping pads on back side of electrical junction boxes in fire-rated walls where boxes are located in same stud space on opposite sides of same wall, and elsewhere required by jurisdictional authority and local fire department.

3.06 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 4000.
- B. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.
- C. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.07 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.08 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200 - JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
- B. ASTM C834 - Standard Specification for Latex Sealants.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- G. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- H. SWRI (VAL) - SWR Institute Validated Products Directory.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
- C. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver to manufacturer sufficient samples for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

2.02 JOINT SEALANTS - GENERAL

2.03 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
- B. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: Standard colors matching finished surfaces, Type OP (opaque).

2.04 SELF-LEVELING SEALANTS

- A. Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Hardness: 75, Shore A, minimum, when tested in accordance with ASTM D2240 after 7 days.
 2. Color: Concrete gray.
 3. Joint Depth: Provide product suitable for joints from 1/8 inch to 1-1/2 inches in depth excluding space for backer rod.

2.05 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

- F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- G. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at the low temperature in the thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- L. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
- M. NFPA 105 - Standard for the Installation of Smoke-Control Door Assemblies.
- N. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with wall construction for anchor placement.
 - 2. Coordinate installation of hardware.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of ANSI A250.8 - SDI-100, and as supplemented in this Section.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes installation requirements.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code for fire rated assemblies.
- B. Fire rated assembly construction to conform to UL 10C.
- C. Installed Frame and Door Assemblies: Comply with NFPA 80 for fire rated class indicated.
- D. Installed Fire-rated Window Assemblies: Comply with NFPA 257 for fire rated class indicated.
- E. Installed Smoke Control Frame and Door Assemblies: Comply with NFPA 105.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
- C. Inspect hollow metal products upon delivery for damage. Minor damage may be repaired provided refinishing is equal in all respects to new work and is acceptable to Architect; otherwise replace damaged items with new products as specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Any listed member of NAAMM HMMA in good standing; www.naamm.org/hmma.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GENERAL DOOR AND FRAME REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.
 - 5. Typical Door Face Sheets: Flush, unless otherwise indicated on Drawings.
 - 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on Drawings.
 - 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - a. Prepare doors and frames for hardware in accordance with templates provided under Section 08 7100.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.

- b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
- c. Model 1 - Full Flush.
- d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
- 2. Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
- 3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
- 4. Door Thickness: 1-3/4 inch, nominal.
- 5. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.
 - 4. Weatherstripping: Separate, see Section 08 7100.
- C. Interior Door Frames, Non-Fire Rated: Face welded type.
 - 1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
 - 2. Frame Finish: Factory primed and field finished.
- D. Door Frames, Fire-Rated: Face welded type.
 - 1. Fire Rating: Same as door, labeled.
 - 2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

2.06 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.07 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified door and frame standards or custom guidelines indicated.
- B. Maximum Diagonal Distortion (Warp): 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

- A. Refer to Door and Frame Schedule on Drawings.

END OF SECTION

SECTION 08 4313 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.
- D. Design engineering of framing system and load-bearing connections to building structural frame system.

1.02 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
- H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- J. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- K. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- L. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- M. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- N. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate attachment and seal of perimeter air and vapor barrier materials.
 - 2. Coordinate with installation of other components that comprise the exterior enclosure.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

- E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State of Colorado.
- B. Installer Qualifications: Company specializing in the installation of aluminum glazing systems with minimum three years of documented experience.
- C. Basis of Design: Drawing details are based on profiles by specified basis of design manufacturer. Similar profiles by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in dimension, profile, and finish are minor, and do not detract from the indicated design intent.
 - 1. Comply with requirements specified in Section 01 4000 and Section .

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this Section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide 10 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturer:
 - 1. Arcadia, Inc.: www.arcadiainc.com.
 - a. Frame Series: AG 451T / AG 601T, center pane, outside glazed, stacking system.
 - b. Door Style: MS 362 Medium Stile / NS 212 Narrow Stile.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Other Acceptable Manufacturers:
 - 1. C.R. Laurence Company, Inc.; U.S. Aluminum: www.crl-arch.com/sle.
 - 2. EFCO Corporation: www.efcocorp.com.
 - 3. Kawneer North America: www.kawneer.com.
 - 4. Manko Window Systems, Inc.: www.mankowindows.com.
 - 5. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
 - 6. Tubelite, Inc.: www.tubeliteinc.com.
 - 7. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
 - 8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STOREFRONT SYSTEM

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Rabbet: For 1 inch insulating glazing.
 - 2. Finish: Class II natural anodized.

- a. Factory finish all surfaces that will be exposed in completed assemblies.
3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - a. Fabricate individual system frame members, comp heads, sill pans, and other system components in single, continuous pieces; splices are not permitted unless specifically required by project installation conditions.
4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
- B. Design Requirements: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 1. Design Wind Loads: Comply with requirements of applicable code.
 2. Member Deflection: Limit member deflection to L/175 of clear span, 3/4 inch total, or to flexure limit of glass in any direction, whichever is less, with full recovery of glazing materials.
 3. Provide reinforced mullion sections as may be required to comply with specified design requirements, for manufacturer's specified system.
- C. Water Penetration Resistance: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf.
- D. Air Leakage: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.24 psf pressure differential across assembly.
- E. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

2.03 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 1. Framing members for interior applications need not be thermally broken.
 2. Glazing Stops: Flush.
 3. Cross-Section: 2 x 4-1/2 inch nominal dimension.
 4. Corner Assemblies:
 - a. 90-Degree Corners: Manufacturer's standard combination of two pocket corner extrusions.
 - b. Corners Other Than 90 Degrees: Manufacturer's standard varying degree pocket corner extrusions with aluminum sheet metal fillers and closures.
 5. Reinforced Mullions: As required or recommended by manufacturer using manufacturer's standard profile of extruded aluminum with internal reinforcement of steel shaped structural section.
- B. Glazing: As specified in Section 08 8000.

- C. Swing Doors: Glazed aluminum.
 - 1. Thickness: 1-3/4 inches.
 - 2. Top Rail: 3-1/2 inches wide.
 - 3. Vertical Stiles: 3-1/2 inches wide.
 - 4. Bottom Rail: 10 inches wide.
 - 5. Glazing Stops: Square.
 - 6. Finish: Same as storefront.
 - 7. Design exterior doors for one inch insulating glass units, and interior doors for 1/4 inch glass.

2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Structural Steel Sections: ASTM A36/A36M; shop primed.
- D. Fasteners: Stainless steel.
- E. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.
- F. Concealed Flashings: Sheet aluminum, 26 gage, 0.017 inch minimum thickness.
- G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- H. Glazing Accessories: As specified in Section 08 8000.
- I. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.05 ACCESSORIES

- A. Reinforcement: Where fasteners screw-anchor into aluminum less than 1/8 inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive, pressed-in splined grommet nuts.
- B. Brackets: High-strength aluminum brackets and reinforcements where possible; otherwise provide non-magnetic stainless steel or galvanized steel complying with ASTM A123/A123M.
- C. Inserts: Cast iron, malleable iron, or 12 gage galvanized steel for required anchorage to concrete or masonry.
- D. Sill Pans: Manufacturer's standard extruded profile, thermally broken, designed to direct moisture to the exterior at sill conditions; including splice sleeves and continuously sealed end dams.
 - 1. Provide with sill pan clips for installation without the use of penetrating fasteners.
- E. Comp-Heads: Manufacturer's standard extruded profile, thermally broken, designed to accommodate minimum one inch deflection of building elements at head conditions.
- F. Water Deflectors: Manufacturer's standard internal system accessory specifically designed to route internal water drainage away from top surfaces of insulated glass units.
- G. Expansion Anchors: Lead shield or toothed steel, drilled in type expansion bolts for required attachment to concrete or masonry.
- H. Bituminous Coatings: Cold-applied asphalt mastic, compounded for 30 mil thickness per coat.
- I. Internal System Sealants and Gaskets: As recommended by manufacturer for use within the framing system for fabrication, assembly, and installation. Use products which will remain permanently elastic, non-shrinking, and waterproof.

2.06 FINISHES

- A. Class II Color Anodized Finish: AAMA 611 AA-M12C22A32 Integrally colored anodic coating not less than 0.4 mils thick.
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.07 HARDWARE

- A. For each door, include weatherstripping and sill sweep strip.
- B. Door Hardware: As specified in Section 7100, except as specified in this Section.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- E. Reinforce components internally for door hardware and door operators.
- F. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies, including exposed fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
 - 1. Install storefronts in accordance with ASTM E2112.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- G. Install sill pans with end dams; do not obstruct weep paths with sealants. Locate sill pan joints, if required, minimum 12 inches from centerline of vertical mullions. Seal to adjacent work to form water tight dam.
- H. Install comp-head units where detailed; do not secure comp-heads to primary storefront head frames.
- I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- J. Set thresholds in bed of sealant and secure.
- K. Install hardware using templates provided.
 - 1. See Section 08 7100 for hardware installation requirements.
- L. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.
- M. Install internal system sealants as installation progresses. Seal sill pan splices, end dams, water deflectors, and other components to ensure that proper water weepage paths are established and maintained within the system.
- N. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

- C. Location: Limit variation from plane or dimensioned location to 1/8 inch in 12 feet, non-cumulative, and 1/2 inch in overall length of member.

3.04 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.05 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 7100 - DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for aluminum and hollow metal doors.
- B. Thresholds.
- C. Weatherstripping, seals and door gaskets.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ANSI/BHMA - BHMA A156--Series Standards for Door Hardware.
- C. BHMA A156.1 - American National Standard for Butts and Hinges.
- D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches.
- E. BHMA A156.3 - American National Standard for Exit Devices.
- F. BHMA A156.4 - American National Standard for Door Controls - Closers.
- G. BHMA A156.7 - American National Standard for Template Hinge Dimensions.
- H. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders.
- I. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000.
- J. BHMA A156.18 - American National Standard for Materials and Finishes.
- K. BHMA A156.21 - American National Standard for Thresholds.
- L. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association.
- M. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
- N. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- Q. UL 305 - Panic Hardware.
- R. UL (DIR) - Online Certifications Directory.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.
 - 2. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
 - 3. Convey Owner's keying requirements to manufacturers.
- B. Sequencing: Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. General Submittal Requirements:
 - 1. Submit copies of the hardware schedule complying with the construction schedule requirements for each draft. Hardware schedules are intended for use in coordinating the work.
 - 2. Format all schedule submittals to the same door numbering system used in this Section and on the door schedule.

3. Furnish initial draft of schedule at earliest possible date, in order to facilitate fabrication of related work which may be critical to the construction schedule.
 4. Furnish final draft of schedule after samples, manufacturer's data sheets, coordination with other work, delivery schedules, and other required information have been completed and accepted.
 5. Final Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
- C. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
 - D. Keying Schedule: Submit complete schedule of key marking and master key system for approval of Owner prior to final acceptance.
 - E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 1. Submit manufacturer's parts lists and templates.
 2. Bitting List: List of combinations as furnished.
 3. Include the name, address, and phone number of the hardware supplier, maintenance instructions, and parts list for each type of operating hardware including locks, exit devices, and closers.
 - F. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - G. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

1.05 QUALITY ASSURANCE

- A. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with minimum five years of experience who is, or employs an experienced Architectural Hardware Consultant (AHC) who is used for consultation on the hardware requirements for this project.
- B. Basis of Design: Specifications are based on hardware types by specified basis of design manufacturer. Hardware types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, grade, function, and profile are minor, and do not detract substantially from the indicated design intent.
 1. Comply with requirements specified in Section 01 4000 and Section .

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide ten year warranty for mechanical hardware including closers, locks, and exit devices; provide two year warranty for electrified hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturers:
 1. Manufacturers and products specified for each hardware item in this Section.
 2. Substitutions: See Section 01 6000 - Product Requirements.

- a. Where substitutions are permitted, acceptability of substituted items may be determined solely on the basis of design, appearance, or finish.

2.02 HARDWARE LIST

- A. Furnish hardware in accordance with hardware schedule at end of this Section and as indicated on door schedule. List is intended to establish design and function of hardware. Provide all hardware items required for proper door function, including fire-rating and labeling requirements.

2.03 GENERAL REQUIREMENTS

- A. Provide door hardware specified, or as required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except where specifically indicated.
- C. Furnish screws for hardware installation with each hardware item. Provide Phillips flat-head screws except where specifically indicated otherwise. Finish exposed screws to match hardware finish, or to match the finish of other work as closely as possible, if exposed in surfaces other than hardware surfaces.
- D. Provide items of a single type of the same model by the same manufacturer.
- E. Provide products that comply with the following:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Accessibility: ADA Standards and ICC A117.1.
 - 3. Fire-Rated Doors: NFPA 80; this requirement takes precedence over other vspecified requirements for such hardware, if specified requirements are in conflict.
 - 4. Panic Hardware: UL 10C and UL 305.
 - 5. All Hardware: ANSI/BHMA Certified; Grade 1 or 2 as scheduled, listed in BHMA Directory of Certified Products.
 - 6. Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
 - 7. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.
 - 8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.
 - 9. Comply with applicable requirements of BHMA A156 Series standards, except as otherwise indicated.
 - 10. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors indicated, and which complies with requirements of scheduled door and frame labels.
- F. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.
- G. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.
- H. Finishes: Provide door hardware of the same finish unless otherwise indicated.
 - 1. Primary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
 - 2. Secondary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
 - a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
 - 3. Finish Definitions: BHMA A156.18.
 - 4. Exceptions:

- a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
 - b. Hinges for Fire-Rated Doors: Steel base metal with plated finish.
- I. Fasteners:
- 1. Solid Core Wood Doors: Sex bolts and nuts (SNB).
 - 2. Concrete and Masonry Substrates: Stainless steel machine screws and lead expansion shields.

2.04 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
 - 1. If no hardware set is indicated for a swinging door provide an office lockset.
 - 2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
 - 3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
 - 1. Provide cams and/or tailpieces as required for locking devices required.
- C. Keying: Master keyed.
 - 1. Include construction keying.
- D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.05 HINGES

- A. Hinges: Provide hinges on every swinging door.
 - 1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 - 2. Provide ball-bearing hinges at all doors with closers, and as scheduled.
 - 3. Provide hinges in the quantities indicated.
 - 4. Provide non-removable pins on exterior doors.
 - 5. Where electrified hardware is mounted in door leaf, provide power transfer hinges.
- B. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7; standard weight, unless otherwise indicated.
 - 1. Provide hinge width required to clear surrounding trim.
- C. Acceptable Manufacturers:
 - 1. ASSA ABLOY Brands; McKinney: www.assaabloydss.com.
 - 2. Bommer Industries, Inc.: www.bommer.com.
 - 3. Hager Companies: www.hagerco.com.
 - 4. Stanley Black & Decker: www.stanleyblackanddecker.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.06 CYLINDRICAL LOCKSETS

- A. Locking Functions: As defined in BHMA A156.2, and as follows.
 - 1. Privacy: F76, emergency tool unlocks.
 - 2. Store Door: F91, locked by key from both sides, not an emergency exit (must be unlocked during occupied hours).
 - 3. Exit Only: F89, may not be left unlocked.
- B. Acceptable Manufacturers:
 - 1. Basis of Design: DORMA Group North America: www.dorma-usa.com/usa.
 - 2. Schlage, an Allegion brand: www.allegion.com/us.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.07 ALUMINUM DOOR LOCKS

- A. Narrow Stile Locks: Lock accepts mortise key or thumbturn cylinders.
 - 1. Throw: 1/2 inch, with latch made of hardened steel.

- B. Locking Functions: As defined in BHMA A156.13, and as follows:
 - 1. Store Door: F14, deadbolt locked by key from both sides, not an emergency exit (must be unlocked during occupied hours).

2.08 EXIT DEVICES

- A. Locking Functions: Functions as defined in BHMA A156.3, and as follows:
 - 1. Entry/Exit, Always-Latched: Key outside locks and unlocks lever, no latch holdback (dogging).
 - 2. Exit Only, Secure: No outside trim, no key entry, no latch holdback, deadlocking latchbolt.
- B. Acceptable Manufacturers:
 - 1. ASSA ABLOY Brands; Sargent: www.assaabloydss.com.
 - 2. Detex Corporation; ADVANTEX Series: www.detex.com/sle.
 - 3. DORMA USA, Inc; 8000 Series, 9000 Series, DG1000 Series, and DG1100 Series: www.dorma.com.
 - 4. Precision Hardware, Inc.: www.precisionhardware.com.
 - 5. Von Duprin, an Allegion brand: www.allegion.com/us.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.

2.09 CLOSERS

- A. Closers: Complying with BHMA A156.4.
 - 1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
 - 2. Provide a door closer on every exterior door.
 - 3. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.
 - 4. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
 - 5. At outswinging exterior doors, mount closer in inside of door.
- B. Acceptable Manufacturers - Closers:
 - 1. ASSA ABLOY Brands; Rixson: www.assaabloydss.com.
 - 2. DORMA USA, Inc; 7400 Series, 8600 Series, 8900 Series, and TS93: www.dorma.com.
 - 3. LCN, an Allegion brand: www.allegion.com/us.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.10 STOPS AND HOLDERS

- A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
 - 1. Provide wall stops, unless otherwise indicated.
 - 2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
 - 3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.
- B. Wall Stops: Surface mounted.
- C. Floor Stops: Surface mounted.
- D. Acceptable Manufacturers - Overhead Stops/holders:
 - 1. Basis of Design: DORMA USA, Inc.; 900 Series: www.dorma.com.
 - 2. ASSA ABLOY Brands; Rixson: www.assaabloydss.com.
 - 3. DORMA USA, Inc; 900 Series: www.dorma.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- E. Acceptable Manufacturers - Wall and Floor Stops/holders:
 - 1. Architectural Builders Hardware Mfg., Inc.: www.abhmfg.com.
 - 2. ASSA ABLOY Brands; Rixson: www.assaabloydss.com.
 - 3. Hager Companies: www.hagerco.com.

4. Trimco, originally called Triangle Brass Manufacturing Co., Inc.:
www.trimcohardware.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.11 GASKETING AND THRESHOLDS

- A. Gaskets: Complying with BHMA A156.22.
 1. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
 - a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.
 2. On each exterior door, provide door bottom sweep, unless otherwise indicated.
- B. Thresholds: Complying with BHMA A156.21.
 1. At each exterior door, provide a threshold unless otherwise indicated.
 2. Field cut threshold to frame for tight fit.
- C. Fasteners At Exterior Locations: Non-corroding.
- D. Acceptable Manufacturers:
 1. ASSA ABLOY Brands; Pemko: www.assaabloydss.com.
 2. Hager Companies: www.hagerco.com.
 3. National Guard Products, Inc: www.ngpinc.com.
 4. Reese Enterprises: www.reeseusa.com.
 5. Zero International, Inc: www.zerointernational.com.
 6. Substitutions: See Section 01 6000 - Product Requirements.

2.12 PROTECTION PLATES AND ARCHITECTURAL TRIM

- A. Protection Plates:
 1. Kickplate: Provide on push side of every door with closer, except aluminum storefront and glass entry doors.
- B. Drip Guard: Provide projecting drip guard over all exterior doors unless they are under a projecting roof or canopy.
- C. Acceptable Manufacturers:
 1. ASSA ABLOY Brands, Rockwood: www.assaabloydss.com.
 2. Ives: www.iveshardware.com.
 3. Hager Companies: www.hagerco.com.
 4. Hiawatha, Inc., division of Activar Construction Products Group, Inc.:
www.activarcpg.com/hiawatha.
 5. Trimco, originally called Triangle Brass Manufacturing Co., Inc.:
www.trimcohardware.com.
 6. Substitutions: See Section 01 6000 - Product Requirements.

2.13 MISCELLANEOUS HARDWARE

- A. Miscellaneous Hardware Items: Provide necessary items where required or scheduled.
- B. Acceptable Manufacturers - Miscellaneous Hardware:
 1. ASSA ABLOY, Rockwood: www.assaabloydss.com.
 2. Glynn-Johnson: www.glynn-johnson.com.
 3. Hager Companies: www.hagerco.com.
 4. Ives: www.iveshardware.com.
 5. Trimco, originally called Triangle Brass Manufacturing Co., Inc.:
www.trimcohardware.com.
 6. Substitutions: See Section 01 6000 - Product Requirements.

2.14 FIRE DEPARTMENT LOCK BOX

- A. Fire Department Lock Box: Heavy-duty, recessed, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
 1. Capacity: Holds 10 keys.

2. Finish: Manufacturer's standard dark bronze.
3. Include location stickers as required by local jurisdiction.
4. Acceptable Products:
 - a. Knox Company; Knox-Box Rapid Entry System, Model 3200R (recessed):
www.knoxbox.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until finishes applied to substrate are complete.
- D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
- E. Wherever cutting and fitting are required to install hardware on surfaces which are to be painted or finished by others, coordinate removal, storage, and reinstallation or application of surface protections with finishing work specified in other Sections.
- F. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as required for proper installation and operation.
- G. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with referenced standards.
- H. Mounting heights for hardware from finished floor to center line of hardware item. As indicated in the following list; unless noted otherwise in Door Hardware Sets Schedule or on the drawings.
 1. For Steel Doors and Frames: Comply with DHI (LOCS) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames".
- I. Set exterior door thresholds with full-width bead of elastomeric sealant on each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
- J. Thresholds:
 1. Cut and fit threshold and floor covers to profile of door frames. Use single piece units, except at floor closers provide mitered corners and hairline joints with concealed welds or concealed mechanical joints, and smooth openings for spindles.
 2. Screw thresholds to substrate with No. 10, or larger screws, of proper type for permanent anchorage. Use bronze, stainless steel, or other non-corrosive base metal screws in contact with threshold metal.
 3. Set each edge of exterior thresholds in continuous sealant as specified in Section 9005. Completely fill voids without obstructing drainage and weep holes.
- K. Hinges:
 1. Use two pair of hinges or two each intermediate pivots at doors 7.5 feet high and over.
 2. Use heavy weight 5 x 4.5 inch hinges at doors 3.5 feet wide and over.
- L. Exit Devices:
 1. Furnish glass bead kits at exit devices where required.
 2. Fasten all exit devices and door closers with sex nuts and bolts (SNB).
 3. Fasten exit devices and door closers with sex nuts and bolts (SNB) only when required by door manufacturer.
- M. Closers: Furnish all brackets, spacer blocks, and special templates required to mount closers, as required by frame or door details.
- N. Kickplate Sizing: Single doors; door width less 2 inches. Pairs of doors; door width less one inch.
- O. Surface Preparation: Clean door jambs of all dirt, grease, oil, solvents or solvent residue, and dust before applying pressure-sensitive adhesive-backed gasketing, smoke seal, or weatherstripping.

3.02 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
- C. Adjust closers with HVAC system out of operation and at full operation for proper closing pressure.
- D. Replace units which cannot be adjusted and lubricated to operate freely and smoothly.
- E. Make final adjustments and lubrication immediately prior to final acceptance. Adjust door control devices to compensate for final operation of heating and ventilation equipment.

3.03 CLEANING

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware according to manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 01 7900 - Demonstration and Training, for additional requirements.
- B. Demonstrate proper operation of electromechanical hardware to Owner's designated representative.

3.05 PROTECTION

- A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

3.06 SCHEDULE

- A. Refer to hardware schedule on Drawings.

END OF SECTION

SECTION 08 8000 - GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing compounds and accessories.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM C1036 - Standard Specification for Flat Glass.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- K. GANA (GM) - GANA Glazing Manual.
- L. GANA (SM) - GANA Sealant Manual.
- M. GANA (LGRM) - Laminated Glazing Reference Manual.
- N. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- O. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- Q. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Insulating Glass Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of glass and plastic units, showing coloration and design.
- E. Certificates: Certify that products of this Section meet or exceed specified requirements.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, SIGMA TM-3000 Glazing Guidelines, and GANA Laminated Glazing Reference Manual for glazing installation methods.

- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years documented experience.
- C. Provide each type of glass, primary sealant, and gasket from a single manufacturer with not less than five years documented experience in the production of required materials.
- D. Basis of Design: Specifications for certain glass products are based on specific glass types by the specified basis of design manufacturer. Glass types manufactured by other acceptable manufacturers are permitted, subject to compliance with all performance requirements; and provided that deviations in performance and coloration are minor, and do not detract substantially from the indicated design intent.
 - 1. Comply with requirements specified in Section 01 4000 and Section .

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions for shipping, handling, storing, and protection of glass and glazing materials. Exercise exceptional care to prevent edge damage to glass, and damage to coatings.
- B. Where insulating glass units will be exposed to substantial altitude changes during shipping, comply with manufacturer's recommendations for venting and sealing.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
- C. Install sealants only when ambient temperature conditions can be maintained at or above 40 degrees F during installation and 48 hours immediately following installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with applicable codes.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 4. Design glazing units to reliably perform and remain reliably engaged on all edges under all service and thermal stresses, including those associated with partial shading.
 - 5. Limit center of glass deflection to the lesser of 3/4 inch or L/100 (where L is short side dimension of glass unit), or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 - 6. Assure and confirm compatibility of all materials in contact with each other.
 - 7. Glass thicknesses listed are minimum.
- B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
 - 1. In conjunction with vapor retarder and joint sealer materials described in other Sections.
- C. Thermal and Optical Performance: Provide glass products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:

1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless noted otherwise.
 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
 3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 and 16 CFR 1201 criteria.
 4. Impact Resistant Safety Glass: Complies with ANSI Z97.1 and 16 CFR 1201 criteria; Class B/Category I.
 5. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.03 INSULATING GLASS UNITS

- A. Insulating Glass Units: Types as indicated on Drawings.
 1. Basis of Design: As specified in this Section below.
 2. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 3. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 4. Metal Edge Spacers: Aluminum, bent and soldered corners.
 5. Spacer Color: Black.
 6. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone sealant as secondary seal applied around perimeter.
 7. Color: Black.
 8. Purge interpane space with dry air, hermetically sealed.
 9. Breather Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
 - a. Breather Tubes: Seal breather tubes upon installation in accordance with insulating glass fabricator's requirements.
- B. Insulating Glass Units: Safety glazing.
 1. Applications:
 - a. Glazed lites in exterior doors.
 - b. Glazed sidelights and panels next to doors.
 - c. Locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations specified or indicated on Drawings.
 2. Space between lites filled with air.
 3. Glass Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.
 4. Total Thickness: 1 inch.

2.04 BASIS OF DESIGN - INSULATING GLASS UNITS

- A. Basis of Design - Insulating Glass Units: Vision glazing, with Low-E coating.
 1. Applications: Exterior insulating glass glazing unless otherwise indicated.
 2. Space between lites filled with air.
 3. Total Thickness: 1 inch.
 4. Glazing Method: Dry glazing method, gasket glazing.
 5. Substitution Procedures: See Section 01 6000 - Product Requirements.

2.05 GLAZING COMPOUNDS

- A. General Requirements:
 - 1. Provide black exposed glazing accessory materials, unless specifically indicated otherwise.
 - 2. Provide materials of hardness as recommended by manufacturer for required application and condition of installation in each case. Provide only compounds which are known to be fully compatible with surfaces contacted, including glass products, seals, and glazing channel surfaces.
- B. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; black color.

2.06 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Silicone, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
 - 1. Size gaskets as required by manufacturer of glazing channel frame to provide proper pressure and bite on glazing units.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.
- D. Sealed Insulating Glass Units: Seal breather tubes immediately prior to glass unit installation with bead of silicone sealant according to sealed insulating glass unit manufacturers requirements; do not crimp, bend, or otherwise damage breather tubes.

3.03 INSTALLATION - GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners; do not block weep paths.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non-permanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Acoustic insulation.
- C. Gypsum sheathing.
- D. Gypsum wallboard.
- E. Joint treatment and accessories.

1.02 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- I. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
- J. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- K. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing Board.
- L. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- M. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- N. GA-216 - Application and Finishing of Gypsum Board.
- O. GA-600 - Fire Resistance Design Manual.
- P. ICC (IBC) - International Building Code.
- Q. UL (FRD) - Fire Resistance Directory.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with mechanical and electrical work. Do not attach or support metal framing to ducts, pipes, conduit, or similar items.
 - 2. Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.
 - 3. Coordinate gypsum board work with requirements of Section 07 8400 to maintain integrity of fire-rated and smoke-rated partitions required to comply with specified regulatory requirements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing.
- B. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Stud Framing: Products that do not comply with ASTM C645 or ASTM C754 are not permitted.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect products in accordance with referenced standards.
- B. Handle gypsum boards to prevent damage to ends, edges, and surfaces.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures at not less than 40 degrees F for non-adhesive attachment of gypsum board, and not less than 50 degrees F for adhesive attachment.
- B. Maintain ambient temperatures at not less than 50 degrees F for a period 48 hours before gypsum board finishing, during installation, and after installation of board materials.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Fire Rated Assemblies: Provide completed assemblies specified on Drawings.
 - 1. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
 - 2. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
 - 3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).
 - 4. Where any specified rated assembly requires the use of proprietary gypsum board system products, installation methods or procedures, comply with specified rated assembly requirements including requirements associated with assembly options which may be selected by Contractor.

2.02 METAL FRAMING MATERIALS

- A. Metal Framing - General: Provide framing materials complying with specified standards and tested assemblies; galvanized sheet steel, 25 gage unless specified, noted, scheduled, or detailed otherwise.
 - 1. Use minimum 20 gage studs at door jambs, tile backing support, and other locations indicated.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 10 psf.
 - 1. Studs: "C" shaped with flat or formed webs.
 - 2. Runners: U shaped, sized to match studs.
- C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
3. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on Drawings; minimum track length of 12 feet.

2.03 BOARD MATERIALS

- A. Board Materials - General:
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Applications: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 3. Thickness: As indicated on Drawings.
 - a. Vertical Surfaces: 5/8 inch.
 - b. Multi-Layer Assemblies: Thicknesses as indicated on Drawings.
- C. Exterior Gypsum Sheathing Board: Sizes to minimize joints in place; ends square cut.
 1. Applications: Exterior sheathing and parapet sheathing, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 4. Thickness: As indicated on Drawings.
- D. Glass-Mat-Faced Parapet Sheathing Board: Comply with performance requirements of ASTM C1396/C1396M for water-resistant gypsum backing board and ASTM C1177/C1177M for sheathing; tapered long edges.
 1. Application: Roof sides of parapets for adhesive application of roofing parapet wall and base flashings.
 2. Thickness: 1/2 inch unless otherwise indicated.
 3. Acceptable Products:

2.04 ACOUSTICAL ACCESSORIES

- A. Acoustic Insulation - General: Use type of acoustical insulation to comply with indicated assembly requirements.
 1. Where any specified rated assembly requires the use of proprietary acoustical insulation products, installation methods or procedures, comply with specified rated assembly requirements including requirements associated with assembly options which may be selected by Contractor.
- B. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
 1. Thickness: Full thickness of indicated wall framing, and 3-1/2 inches thick to comply with specified floor/ceiling assembly rating requirements.
- C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

2.05 INSTALLATION AND FINISHING ACCESSORIES

- A. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 1. Types: As detailed or required for finished appearance.
 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
 3. Control Joints: One-piece, v-grooved control joint with integral perforated flanges; removable tape to protect v-groove during finishing.
 - a. Applications: Locations specifically noted on Drawings; also located at internal corners, wall locations at re-entrant soffit corners, and ceiling locations at re-entrant soffit corners whether or not specifically noted on Drawings.

- B. Joint Materials: ASTM C475/C475M, and as recommended by gypsum board manufacturer for project conditions.
 - 1. Interior Gypsum Board Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 2. Joint Compound for Wet and Exterior Locations: Chemical quick-setting type for first 2 coats, and vinyl type top coat specially formulated for finishing topping.
 - 3. Joint Treatment for Cementitious Backer Board: Minimum 2 inch wide open mesh glass fiber tape acceptable to board manufacturer and tile manufacturer.
- C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this Section before commencing work of this Section.

3.02 PREPARATION

- A. Furnish concrete inserts, steel deck hanger clips, and similar devices to other trades for installation well in advance of time needed for coordination with other work.

3.03 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Building Expansion Joints: Do not bridge building expansion joints with support system. Frame both sides of joints with furring and other support as indicated.
- C. Studs: Space studs as permitted by standard or as specified below.
 - 1. Space studs 16 inches on center, except as otherwise indicated or required by specified tested assemblies, and secure to floor and ceiling runners with screws.
 - 2. Provide supplemental framing matching primary wall framing to support cut edges of gypsum boards not supported by primary vertical wall framing members.
 - 3. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 4. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - 5. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
 - 1. Access Doors: Coordinate placement of openings for access doors and hatches with Architect before framing opening. Avoid placing openings at highly visible locations on wall and ceilings. Refer to Section 08 3100.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install as follows:
 - 1. Place one bead continuously on substrate before installation of perimeter framing members.
 - 2. Place continuous bead at perimeter of each layer of gypsum board.
 - 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.05 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
 - 1. Space fasteners in accordance with ASTM C840 and manufacturer's recommendations, unless fastener spacing is otherwise specified on structural Drawings for structural load-bearing walls.
 - 2. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- B. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
 - 1. Limit annular space between gypsum wall board edges and electrical device boxes to maximum 1/8 inch, or as limited by applicable Code.
- C. Exterior Sheathing Board Applications: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 - 1. Seal joints, cut edges, and holes with water-resistant sealant.
 - 2. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces as indicated on Drawings; if not specifically indicated, provide control joints as follows:
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.07 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 - 2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
 - 3. Taping, filling and sanding is not required at base layer of double layer applications.

3.08 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 9113 - EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.

1.02 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this Section.
- B. Gloss Ratings: ASTM D523; on 85 and 60 degree gloss meters:
 - 1. Flat: 0 to 15 (85 degree gloss meter).
 - 2. Eggshell: 5 to 20 (60 degree gloss meter).
 - 3. Satin: 15 to 35 (60 degree gloss meter).
 - 4. Semi-Gloss: 30 to 65 (60 degree gloss meter).
 - 5. Gloss (High): 65 and Greater (60 degree gloss meter).

1.03 REFERENCE STANDARDS

- A. ASTM D523 - Standard Test Method for Specular Gloss.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.
- D. SSPC-SP 1 - Solvent Cleaning.
- E. SSPC-SP 6 - Commercial Blast Cleaning.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on aluminum sheet, 8 x 10 inch in size.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

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

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Acceptable Manufacturers:
 - 1. Benjamin Moore & Co.: www.benjaminmoore.com.
 - 2. Comex Group; Kwal Paint: www.thecomexgroup.com.
 - 3. PPG Paints: www.ppgpaints.com.
 - 4. Sherwin-Williams Company: www.sherwin-williams.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- C. Acceptable Manufacturers - Primers and Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors: As scheduled on Drawings.

2.03 PAINT SYSTEMS

- A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, and primed metal.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Exterior Ferrous Metals, Primed, Latex, 2-coat:
 - a. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 - b. Semi-gloss: Two coats of latex enamel.
 - 1) Acceptable Product: Sherwin-Williams Pro Industrial Acrylic, B66-650 Series.
 - 3. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations unless otherwise indicated or specified.
 - 4. Primers: As recommended by top coat manufacturer for specific substrate.
- B. Concrete/Masonry, Opaque, Alkyd, 3 Coat:
 - 1. One coat of block filler.
 - 2. Semi-gloss: Two coats of alkyd enamel.
- C. Ferrous Metals, Primed, Alkyd, 2 Coat:
 - 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 - 2. Semi-gloss: Two coats of alkyd enamel.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Exterior Plaster and Stucco: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

2. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches. Allow to dry.
- G. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
- H. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.
- I. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 PAINTING AND COATING - GENERAL

- A. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 2. Exposed surfaces of steel lintels and ledge angles.
 3. Items specifically indicated on Drawings to receive paint finish.
- B. Do Not Paint or Finish the Following Items:
1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 2. Items indicated to receive other finishes.
 3. Items indicated to remain unfinished.
 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 5. Non-metallic roofing and flashing.
 6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 7. Marble, granite, slate, and other natural stones.
 8. Floors, unless specifically indicated.
 9. Ceramic and other types of tiles.
 10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 11. Exterior insulation and finish system (EIFS).
 12. Glass.
 13. Concrete masonry units in utility, mechanical, and electrical spaces.
 14. Concealed pipes, ducts, and conduits.

3.04 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide.
- B. NFPA 10 - Standard for Portable Fire Extinguishers.
- C. UL (DIR) - Online Certifications Directory.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.04 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturer:
 - 1. Larsen's Manufacturing Co.: www.larsensmfg.com.
 - a. Fire Extinguishers: Manufacturer's model numbers for sizes and types specified.
 - b. Fire Extinguisher Cabinets: Architectural Series FS SS 2409 R2 (recessed) and FS SS 2409 R4 (semi-recessed) with solid door.
- B. Other Acceptable Manufacturers:
 - 1. Ansul, a Tyco Business: www.ansul.com.
 - 2. JL Industries, Inc.: www.jlindustries.com.
 - 3. Kidde, a unit of United Technologies Corp.: www.kidde.com.
 - 4. Larsen's Manufacturing Co.: www.larsensmfg.com.
 - 5. Nystrom, Inc.: www.nystrom.com.
 - 6. Potter-Roemer: www.potterroemer.com.
 - 7. Pyro-Chem, a Tyco Business: www.pyrochem.com.
 - 8. Strike First Corporation of America: www.strikefirstusa.com.
 - 9. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
 - 1. Stored Pressure Operated: Deep Drawn.
 - 2. Class: A:B:C type.
 - 3. Size: 10 pound.
 - 4. Finish: Baked polyester powder coat, red color.
 - 5. Temperature Range: -65 degrees F to 120 degrees F.

2.03 CABINETS

- A. Cabinet Configuration: Semi-recessed type, unless otherwise indicated or specified.
 - 1. Sized to accommodate scheduled items and accessories.
 - 2. Trimless type.
 - 3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- B. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.
- C. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- E. Weld, fill, and grind components smooth.
- F. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.
- G. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Extinguisher Theft Alarm: Battery operated alarm, 10 second delay for disarming, activated by opening cabinet door.
- C. Graphic Identification: "FIRE EXTINGUISHER"; black color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Fire Extinguisher/Valve Cabinets: Install cabinets plumb and level in wall openings, maximum 30 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

END OF SECTION

SECTION 31 1000 - SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

1.03 QUALITY ASSURANCE

- A. Clearing Firm: Company specializing in the type of work required.
 - 1. Minimum of three years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 31 2300.

PART 3 EXECUTION

3.01 PREPARATION

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
- B. Salvagable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify Utility Notification Center of local jurisdiction before site clearing.
- D. Do not commence site clearing operations until temporary erosion and sedimentation-control and plant protection measures are in place.
- E. Protect and maintain benchmarks and survey control points from disturbance.
- F. Protect site improvements to remain from damage. Restore damaged improvements to condition existing before start of site clearing.
- G. Do not store materials or equipment or permit excavation within drip line of remaining trees.
- H. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the Erosion Control Drawings, as approved by local jurisdiction.
- I. Locate and clearly flag trees and vegetation to remain or to be relocated.
- J. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.

3.02 SITE CLEARING

- A. Comply with other requirements specified in Section 01 7000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- C. Protect remaining trees and shrubs from damage and maintain vegetation. Employ a licensed arborist to repair tree and shrub damage. Restore damaged vegetation. Replace damaged trees that cannot be restored to full growth, as determined by arborist.
- D. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
- E. Strip topsoil. Stockpile topsoil that will be reused in the Work.
 - 1. Stockpile surplus topsoil to allow for respreading deeper topsoil.

- F. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- G. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Neatly saw-cut length of existing pavement to remain before removing existing pavement.
- H. In areas not to be further excavated, fill depressions resulting from site clearing. Place and compact satisfactory soil materials in 8-inch-thick layers to density of surrounding original ground.
- I. Dispose of waste materials, including trash, debris, and excess topsoil, off Owner's property. Burning waste materials on-site is not permitted.
 - 1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

3.03 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Protect existing utilities to remain from damage.
- B. Do not disrupt public utilities without permit from authority having jurisdiction.
- C. Protect existing structures and other elements that are not to be removed.

3.04 VEGETATION

- A. Do not begin clearing until vegetation to be relocated has been removed.
- B. Do not remove or damage vegetation beyond the limits indicated on Drawings.
- C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain.
- D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- E. Vegetation Removed: Do not burn, bury, landfill, or leave on site.
 - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- F. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
- G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.05 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 2300 - EARTHWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rough grading the site for site structures and building pads.
- B. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.
- C. Filling, backfilling, and compacting for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, utilities within the building, and _____.
- D. Trenching for utilities outside the building to utility main connections.
- E. Backfilling and compacting for utilities outside the building to utility main connections.
- F. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED SECTIONS

- A. Document 00 3100 - Available Project Information: Geotechnical report; bore hole locations and findings of subsurface materials.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on Drawings.
- B. Subgrade Elevations: Indicated on Drawings.

1.04 REFERENCE STANDARDS

- A. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)).
- B. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- C. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2004.
- D. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- E. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate requirements for special foundations and load bearing elements specified in other Sections.
- B. Preinstallation Meeting: Conduct a preinstallation meeting minimum one week prior to the start of the work of this Section; require attendance by all affected installers, and Owner's geotechnical engineering consultant.
 - 1. Convene under general provisions of Section 01 7000.
 - 2. Discuss all earthwork requirements specified, and document any additional requirements or modified requirements received from Owner and Owner's geotechnical engineer which require a modification of the Contract.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Samples: 50 lb sample of each type of fill; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- E. Compaction Density Test Reports.

- F. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. Locate stockpiles where designated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

- A. Soil materials, whether from sources on or off site must be approved by Owner's geotechnical engineer as suitable for intended use.

2.02 MATERIALS

- A. General Fill: Subsoil excavated on-site.
 - 1. Graded and moisture conditioned as specified.
 - 2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 3. Conforming to ASTM D2487 Group Symbol CL.

2.03 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Verify structural ability of unsupported walls to support imposed loads by the fill.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect from damage above- and below-grade utilities that remain.
- C. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- D. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

3.03 ROUGH GRADING

- A. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- B. Benching Slopes: Horizontally bench existing slopes greater than 1:5 to key fill material to slope for firm bearing.
- C. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL AND STOCKPILING

- A. Remove excavated material that is unsuitable for re-use from site.
- B. Remove excess excavated material from site.

- C. Stockpile excavated topsoil to be re-used on site; remove remainder from site.
- D. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.
- E. Use of explosives is not permitted.

3.05 EXCAVATING

- A. Underpin adjacent structures that may be damaged by excavating work.
- B. Excavate to accommodate new structures and construction operations.
- C. Excavate subsoil required for building pad to a depth of 3 feet below bottom of floor slab elevation and to a point 5 feet beyond the building line.
 - 1. Excavate for utilities trenches, construction operations, and other work as specified in this Section and other Sections.
 - 2. Notify Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- D. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored; comply with local, State and Federal regulations for excavation support.
- E. Do not interfere with 45 degree bearing splay of foundations.
- F. Hand trim excavations. Remove loose matter.
- G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed.
- H. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- I. Prepare excavated building pad and paving subgrade areas prior to backfilling; scarify subgrade surfaces to a depth of 12 inches.
 - 1. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill.
 - 2. Moisture condition and re-compact subgrade to density equal to or greater than requirements for subsequent fill material, unless otherwise specified.
 - 3. Proof roll compacted subgrade areas to identify soft spots; remediate soft spots by scarifying, moisture conditioning, and recompacting until all subgrade areas comply with specified requirements.
 - 4. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.06 TRENCHING

- A. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored; comply with local, State and Federal regulations for excavation support.
- B. Do not interfere with 45 degree bearing splay of foundations.
- C. Cut trenches wide enough to allow inspection of installed utilities.
- D. Hand trim excavations. Remove loose matter.
- E. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- F. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- G. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.
- H. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

3.07 BACKFILLING

- A. Backfill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Moisture Content: Maintain moisture content of fill and backfill materials, expressed as a percentage in relation to optimum moisture content, to attain required compaction density.

- E. Slope grade away from building minimum 5 percent in the first 5 to 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- F. Correct areas that are over-excavated.
 - 1. All Areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- G. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under Paving, Slabs-on-Grade, and Similar Construction: 95 percent of maximum dry density.
 - 2. At Other Locations: 95 percent of maximum dry density.
- H. Reshape and re-compact fills subjected to vehicular traffic.

3.08 BEDDING AND FILL AT SPECIFIC LOCATIONS

- A. The paragraphs below identify location, fill material to be used (identified from lower to upper fill type), and compacted thickness of each fill:
- B. Utility Piping, Conduits, Duct Bank, and Similar Items:
 - 1. Bedding: Use general fill.
 - 2. Backfill: Cover with general fill.
 - 3. Fill up to subgrade elevation.
- C. At Interior Slab-on-Grade:
 - 1. Use general fill.
 - 2. Fill 36 inches deep.
 - 3. Fill up to subgrade elevation.
 - 4. Place vapor retarder over finished subgrade as specified in Section 03 3000.
- D. At Exterior Side of Foundation Walls and Retaining Wall Backfill:
 - 1. Use general fill.
 - 2. Fill up to 0 inches below finish grade.
- E. Fill Under Asphalt and Concrete Vehicular Paving:
 - 1. Use general fill.
 - 2. Fill up to subgrade elevation.

3.09 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- D. Complete finish grading to elevations and slopes indicated.

3.10 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.11 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

- C. Compaction density testing will be performed on compacted fill in accordance with ASTM D6938 or ASTM D2922.
- D. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor") or ASTM D1557 ("modified Proctor").
- E. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- F. Frequency of Tests:
 - 1. Conduct at least one test for each strata of soil on which foundations will be placed, to verify required design bearing capacities.
 - 2. Prior to start of fill work at building pad, conduct field density tests of bottom of building pad excavation, at each column footing location, and one density test for each 100 lineal feet of continuous spread footing.
 - 3. Conduct one field density test of top 12 inches of subgrade for every 5,000 square feet of paved area or building slab. Provide additional tests in each compacted fill layer for fills exceeding 30 inches in depth.
 - 4. Conduct at least one field density test for foundation wall backfill at bottom and top lifts, and not less than one set of tests for each 100 lineal feet of backfill.
 - 5. Conduct at least one field density test for each 200 cubic yard of backfill for trenches at bottom, middle, and top lifts, and not less than one set of tests for each 250 lineal feet of trench.
- G. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.12 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

3.13 MAINTENANCE

- A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerance.
- C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.
- D. Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.15 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 32 1216 - ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Bituminous concrete paving.

1.02 REFERENCE STANDARDS

- A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
- B. AI MS-19 - A Basic Asphalt Emulsion Manual.
- C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN m/m³).
- D. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
- E. CDOT - Colorado Department of Transportation - Standard Specifications for Road and Bridge Construction; current edition.
- F. Colorado Department of Transportation (CDOT) - Field Materials Manual.
 - 1. Colorado Procedure 45 - Determining Percent of Particles with Two or More Fractured Faces.
 - 2. Colorado Procedure 48 - Determination of the Voids in the Mineral Aggregate.
 - 3. Colorado Procedure 50 - Calculation of Dust to Asphalt Ratio of Bituminous Mixtures.
- G. Colorado Department of Transportation (CDOT) - Laboratory Manual for Test Procedures.
 - 1. Colorado Procedure L 5106 - Resistance to Deformation of Bituminous Mixtures by Means of Hveem Apparatus.
 - 2. Colorado Procedure L 5109 - Resistance of Compacted Bituminous Mixture to Moisture Induced Damage.
 - 3. Colorado Procedure L 5115 - Preparing and Determining the Density of Bituminous Mixture Test Specimens Compacted by the Superpave Gyratory Compactor.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Mix Design: Submit proposed mix design of each class of mix for review prior to commencement of work.
- C. Certificates: Submit two copies of material certificates signed by the material producer and Contractor, certifying that each material item complies with specified requirements.
 - 1. If requested, submit independent testing laboratory reports on aggregates and asphalt for sieve analysis, wear abrasion and other specified characteristics.
- D. Project Record Documents: Maintain record of time and date of placement, temperature and weather conditions at time of placement.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Colorado Highways standard.
- B. Mixing Plant: Conform to State of Colorado Highways standard.
- C. Obtain materials from same source throughout.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Transport mixtures from mixing plant in trucks with tight, clean, non-sticking compartments. Provide covers to protect from weather and to prevent loss of heat when ambient temperature is below 50 degrees F.

1.07 FIELD CONDITIONS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.
 - 1. Exception: Ambient temperature must be above 50 degrees F for the final asphalt wearing surface.
- B. Place bitumen mixture when temperature is not more than 15 degrees F below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Asphalt Cement: In accordance with State of Colorado Highways standards.
- B. Aggregate for Base Course: In accordance with State of Colorado Highways standards.
- C. Aggregate for Binder Course: In accordance with Municipality of Greeley Public Work's standards.
- D. Aggregate for Wearing Course: In accordance with Municipality of Greeley Public Work's standards.
- E. Fine Aggregate: In accordance with Municipality of Greeley Public Work's standards.
- F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- G. Primer: Cut-back petroleum asphalt.
- H. Tack Coat: Homogeneous, medium curing, liquid asphalt.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Use dry material to avoid foaming. Mix uniformly.
- B. Asphalt Concrete Properties:
 - 1. Air Voids at N (Initial) (For Information Only): Minimum 9.5 percent according to Colorado Procedure 48.
 - 2. Air Voids at N (Design): 3.5 to 4.5 percent according to Colorado Procedure 48.
 - 3. Lab Compaction (Initial) (For Information Only): 7 revolutions according to Colorado Procedure L 5115.
 - 4. Lab Compaction (Design): 75 revolutions according to Colorado Procedure L 5115.
 - 5. Stability: 28 minimum according to Colorado Procedure L 5106.
 - 6. Aggregate Retained on the No. 4 Sieve: 70 percent minimum, with at least two mechanically induced fractured faces, according to Colorado Procedure 45.
 - 7. Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman): 80 minimum, according to Colorado Procedure L 5109, Method B.
 - 8. Dry Split Tensile Strength: Minimum 30 psi, according to Colorado Procedure L 5109, Method B.
 - 9. Voids in Mineral Aggregate (VMA): Percent voids corresponding to mineral aggregate sizes within each mix to achieve specified design criteria, tested according to Colorado Procedure 48.
 - 10. Voids Filled with Asphalt (VFA): Minimum 65 - 80 percent, according to AI MS-2.
 - 11. Dust to Asphalt Ratio - Fine Gradation: 0.6 - 1.2, according to Colorado Procedure 50.
 - 12. Dust to Asphalt Ratio - Coarse Gradation: 0.8 - 1.6, according to Colorado Procedure 50.
- C. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 ACCESSORIES

- A. Herbicide: Chemical root inhibitor.
- B. Pavement Marking Paint: Specified in Section 32 1723.13.
- C. Concrete Parking Bumpers: Specified in Section 1713.

2.04 SOURCE QUALITY CONTROL

- A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 PREPARATION - BASE SOILS

- A. Coordinate compaction of soil base with Section 31 2300.
- B. Proof roll areas to be paved with pneumatic tired equipment with a minimum axle load of 18 kips per axle. Where soft areas occur, remove loose materials and replace with base course aggregate compacted to level of subgrade.
- C. Verify accuracy of site grading will result in minimum specified base course and asphalt thicknesses. Identify necessary refinements and modifications which may be necessary for proper drainage.
- D. Apply herbicide at rate recommended by manufacturer; full coverage over paved areas. Remove surface vegetation within three days prior to application. Limit application of sterilant only to pavement areas.

3.03 PREPARATION - BASE COURSE

- A. Place and compact base course as specified, if composite asphalt pavement section is selected.

3.04 PREPARATION - PAVEMENT

- A. Primer:
 - 1. Apply primer in accordance with manufacturer's instructions.
 - 2. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.
 - 3. Use clean sand to blot excess primer.
- B. Tack Coat:
 - 1. Apply tack coat in accordance with AI MS-19.
 - 2. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.
- C. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 PLACING ASPHALT PAVEMENT

- A. Install Work in accordance with State of Colorado Highways standards.
- B. Place asphalt within 24 hours of applying primer or tack coat.
- C. Place wearing course within two hours of placing and compacting binder course.
- D. Do not locate seams on vehicle wheel lines parallel to the direction of traffic.
- E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 PAVEMENT PATCHING

- A. Cut and fill with fresh, hot asphaltic concrete. Remove deficient areas for full depth of surface and base course.
- B. Cut sides vertically, perpendicular and parallel to direction of traffic for extent of failure.
- C. Compact and finish as specified.
- D. Patch test holes full depth of section and finish flush with adjoining work.

- E. Where patching is required in rights-of-way or on public property, patch as required by local jurisdiction, but not less than minimum requirements of this Section.

3.07 INSTALLATION - ACCESSORIES

- A. Parking Bumpers: Install according to Section 1713.
- B. Pavement Marking Paint: Apply according to Section 32 1723.13.

3.08 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.
- C. Variation from True Elevation: Within 1/2 inch.

3.09 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.
- B. Include tests for compaction and thickness of entire pavement section and each course as installation progresses.
- C. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.
- D. Testing organization will test in-place compaction of base course in accordance with ASTM D1557.

3.10 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 7 days or until surface temperature is less than 140 degrees F.

3.11 SCHEDULE

- A. Compaction requirements below are expressed as a percentage of maximum theoretical density determined in accordance with ASTM D2950.

END OF SECTION

SECTION 32 1313 - CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks, stair steps, gutters, parking areas, and similar site elements.

1.02 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- B. ACI 301 - Specifications for Structural Concrete.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- F. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- G. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- H. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- I. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- J. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
- K. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- L. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- M. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
- N. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- O. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- P. CDOT - Colorado Department of Transportation - Standard Specifications for Road and Bridge Construction; current edition.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on joint filler, admixtures, and curing compound.
- C. Mix Designs: Submit proposed mix design for each class of concrete specified. Include proportions of ingredients, aggregate analysis, cement brand and type, slump, water/cement ratio, and strength test reports for 7 and 28 day strengths.
 - 1. Prepare in accordance with ACI 301.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Form Materials: As specified in Section 03 3000; conform to ACI 301.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
 - 1. Thickness: 1/2 inch.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) yield strength; deformed billet steel bars; unfinished.
- B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.

2.03 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Fine and Coarse Mix Aggregates: ASTM C33/C33M.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Water: Clean, and not detrimental to concrete.
- E. Air-Entraining Admixtures: ASTM C260/C260M.

2.04 ACCESSORIES

- A. Curing Compound: ASTM C309, Type 2 (white pigmented), Class A.
- B. Joint Sealer: Specified in Section 07 9200.

2.05 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- D. Concrete Properties:
 - 1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4,500 psi.
 - 2. Fly Ash Content: Maximum 20 percent of cementitious materials by weight.
 - 3. Cement Content: Minimum 6 sacks per cubic yard.
 - 4. Water-Cement Ratio: Maximum 45 percent by weight.
 - 5. Total Air Content: 5 to 7 percent, determined in accordance with ASTM C173/C173M.
 - 6. Maximum Slump: 4 inches.
 - 7. Maximum Aggregate Size: 1 1/2 inch.

2.06 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. See Section 2300 for construction of base course for work of this Section.

3.03 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.

3.04 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

- A. Place reinforcement at midheight of slabs-on-grade.
- B. Interrupt reinforcement at expansion joints.

3.06 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 301 when concreting during hot or cold weather.
- B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.07 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Do not place concrete when base surface is wet.
- C. Ensure reinforcement, inserts, embedded parts, formed joints and similar items are not disturbed during concrete placement.
- D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- E. Place concrete to pattern indicated.

3.08 JOINTS

- A. Place 1/2 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
 - 1. Form joints with joint filler extending from bottom of pavement to within 3/4 inch of finished surface.
 - 2. Secure to resist movement by wet concrete.
- B. Provide sawn and tooled joints where indicated on Drawings.
 - 1. At spacing and layout indicated on Drawings.
 - 2. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut minimum 1/3 into depth of slab.

3.09 FINISHING

- A. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge; 1/4 inch radius.
- B. Vehicular Paving: Light broom, texture perpendicular to direction of travel.
- C. Curbs and Gutters: Light broom, texture parallel to pavement direction.
- D. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.10 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.

2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
 3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- B. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure five concrete test cylinders. For each day's placement, obtain test samples for every 100 cu yd or less of each class of concrete placed.
1. Test one cylinder at 7 days, three at 28 days, and hold one for further testing, if necessary.
 2. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 3. Perform one slump and air content test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 32 1713 - PARKING BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete parking bumpers and anchorage.

1.02 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- B. ASTM C150/C150M - Standard Specification for Portland Cement.
- C. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
- D. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Parking Bumpers: Precast concrete, conforming to the following:
 - 1. Nominal Size: 8 inches high, 8 inches wide, 6 feet long.
 - 2. Profile: Manufacturer's standard.
 - 3. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
 - 4. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
 - 5. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
 - 6. Air Entrainment Admixture: ASTM C260/C260M.
 - 7. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
 - 8. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
 - 9. Embed reinforcing steel, and drill or sleeve for two dowels.
 - 10. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
 - 11. Minor patching in plant is acceptable, providing appearance of units is not impaired.
- B. Dowels: Cut reinforcing steel, 1/2 inch diameter, 24 inch long, pointed tip.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Fasten units in place with 2 dowels per unit.

END OF SECTION

SECTION 32 1723.13 - PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Parking lot markings, including parking bays, crosswalks, arrows, and handicapped symbols.

1.02 REFERENCE STANDARDS

- A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.
- B. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.05 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as specified.
 - 1. Drive Lanes and Directional Symbols: Yellow.
 - 2. Parking Stalls: White.
 - 3. Handicapped Symbols: Blue and white.
- B. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation.
 - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
- D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each

application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

- E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.
- F. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
 - 1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
 - 2. At Contractor's option, temporary marking tape may be used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.
- C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- D. Comply with FHWA MUTCD manual (<http://mutcd.fhwa.dot.gov>) for details not shown.
- E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the Drawings true, sharp edges and ends.
 - 1. Apply paint in one coat only.
 - 2. Wet Film Thickness: 0.015 inch, minimum.
 - 3. Length Tolerance: Plus or minus 2 inches.
 - 4. Width Tolerance: Plus or minus 1/8 inch.
- G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on Drawings.
 - 1. Mark the International Handicapped Symbol at indicated parking spaces.
 - 2. Hand application by pneumatic spray is acceptable.
- H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.
- F. Replace removed markings at no additional cost to Owner.

END OF SECTION