

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Work restrictions.
5. Permits.
6. Specification and drawing conventions.

- B. Related Section:

1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: Mary J. Scherlach Counseling Center

1. Project Location: 121 Old Mine Road, Trumbull, CT

- B. Owner: Town of Trumbull, 5688 Main Street, Trumbull, Connecticut

- C. Architect: Antinozzi Associates, P.C.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. Scope of work includes renovations and alterations to the existing facility including miscellaneous sitework. Interior work includes but is not limited to general construction, mechanical, electrical, plumbing and structural work. Exterior work includes but is not limited to siding, roofing, windows, power-washing and re-pointing of brick veneer.

B. Type of Contract

1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.6 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to work areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to **40 feet** beyond new building perimeter.
 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise indicated.
 1. Weekend Hours: Only with prior approval from the owner.
 2. Early Morning Hours: Only with prior approval from the owner.
 3. Hours for Utility Shutdowns: With 72 hours notice.

1.8 PERMIT FEES

- A. The General Contractor shall obtain all permits for the project. The Town is exempt from general building permit fees, however the General Contractor is responsible for paying the state education portion of the fee only. All other applicable state or local fees and charges are the responsibility of the General Contractor.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 1 General Requirements: Requirements of Sections in Division 1 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard.

1.10 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Refer to Bid Form for list of Alternates.

END OF SECTION 01 23 00

SECTION 012500 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, within this specification.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 5 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Recommended form is AIA Document G709 for Proposal Requests.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701 (or similar format).

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 (or similar format). Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.

- b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
- a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
- a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
6. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.
- C. Retainage: Owner shall retain 10% of each progress payment until proof of the project's substantial completion. Upon substantial completion, Owner shall retain 5% of the remaining project completion cost. Upon final project completion and closeout, the Owner will then proceed to release the remaining retainage amount and make final payment to the Contractor.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. When an application shows completion of an item, submit final or full waivers.
 2. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 3. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
 16. Initial settlement survey and damage report if required.

- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Related Sections include the following:
 - 1. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.5 SUBMITTALS

- A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Architect will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
 2. Agenda: Architect shall prepare the meeting agenda and distribute the agenda to all invited attendees.
 3. Minutes: Architect shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Contractor, within three days of the meeting.

- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of Record Documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
 3. Minutes: Architect will record and distribute meeting minutes.
- C. Progress Meetings: Conduct progress meetings at regular intervals not exceeding every week. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

- a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
3. Minutes: Architect will record and distribute the meeting minutes to the Project team.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: CSI Form 13.2A.
1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow five working days for Architect's response for each RFI. RFIs received after 3:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at each progress meeting. Include the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Start-up construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Field condition reports.
 - 6. Special reports.
- B. Related Sections:
 - 1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 2. Division 01 Section "Quality Control" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format
 - 1. Three paper copies.
- B. Start-up construction schedule.
 - 1. Approval of cost-loaded start-up construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. Daily Construction Reports: Submit at weekly intervals.
- E. Material Location Reports: Submit at weekly intervals.
- F. Field Condition Reports: Submit at time of discovery of differing conditions.
- G. Special Reports: Submit at time of unusual event.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

- B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

2.2 START-UP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within seven days of date established for the Notice of Award.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 30 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 7 days of date established for commencement of the Work. Base schedule on the start-up construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require two months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.

- B. Start-up Network Diagram: Submit diagram within [14] <Insert number> days of date established for [commencement of the Work] [the Notice to Proceed] [the Notice of Award]. Outline significant construction activities for the first [90] <Insert number> days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a[**cost- and resource-loaded,**] time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than [60] <Insert number> days after date established for [commencement of the Work] [the Notice to Proceed] [the Notice of Award].
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (refer to special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.

15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner's Representative, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.

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

END OF SECTION 013200

PART 1 - GENERAL

1.1 PROCEDURES

- A. Deliver submittals to the Architect, Antinozzi Associates, at 271 Fairfield Avenue, Bridgeport, CT 06604.
- B. Identify project, Contractor, subcontractor, major supplier; identify pertinent drawing sheet and detail number, and specification section number, as appropriate. Identify deviations from Contract Documents. Provide space for Contractor and Architect review stamps.
- C. Coordinate submittals with progress schedule to insure ample time for review process. Coordinate submittal of related items.
- D. After Architect's review of submittal, revise and resubmit if required, identifying changes made since previous submittal.
- E. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.2 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial progress schedule within 4 days after approval of schedule of values (breakdown).

1.3 SCHEDULE OF VALUES

- A. Submit initial schedule of values (breakdown) within 10 days after award of contract.
- B. Format: Use Table of Contents of this Project Manual as a guide for developing line items. Identify each line item with number and title of Specification Sections. (Items that carry no assignable values, such as cover page, shall be omitted and like items such as bonds and insurances may be combined.)
- C. Include in each line item a directly proportional amount of Contractors overhead and profit.
- D. With each subsequent submission of application for payment, update schedule to include change orders. Include descriptive headings in addition to Change Order Numbers.

1.4 NUMBER TO BE SUBMITTED

- A. Shop Drawings: Three (3) copies plus additional copies required by the Contractor.
- B. Product Data: Three (3) copies plus additional copies required by the Contractor.

END OF SECTION 01 33 00

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. General Quality Control.
- B. Workmanship.
- C. Manufacturers' Instructions.
- D. Manufacturers' Certificates.
- E. Testing Laboratory Services.

1.2 QUALITY CONTROL - GENERAL

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Submit to the owner safety data sheets for all materials delivered to the site.

1.3 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Employ persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.4 MANUFACTURERS' INSTRUCTIONS

- A. When required by individual specification sections, submit manufacturer's printed instructions in the number of copies the Contractor requires plus three (3) which will be retained by Architect.
- B. Comply with instructions in full detail and include each step in sequence. Should instructions conflict with Contract Documents, request clarification from Architect before proceeding.

1.5 MANUFACTURERS' CERTIFICATES

- A. When required by individual Specification Sections, submit manufacturers' certificate, in duplicate, that products meet or exceed specified requirements.

1.6 TESTING LABORATORY SERVICES

- A. Employ and pay for services of an independent testing laboratory to perform inspections and tests, when so specified in individual Specification Sections.

- B. Services shall be performed in accordance with requirements of governing authorities and with specified standards.
- C. Reports shall be submitted to Architect giving observations and results of tests, indicating compliance or non-compliance with specified standards and with Contract Documents.
- D. Contractor shall cooperate with testing laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage, and assistance as requested.
 - 1. Notify Architect and testing laboratory 24 hours prior to expected time for operations requiring testing services.
 - 2. Make arrangements with testing laboratory and pay for additional samples and tests ordered for Contractor's convenience.
- E. When reports indicate non-compliance, take appropriate corrective measures and request for inspection or retesting. The costs of corrective work, re inspections, and retesting shall be paid by the Contractor at no extra cost to the Owner.

PART 2 - PRODUCTS Not used

PART 3 - EXECUTION Not used

END OF SECTION 01 40 00

PART 1 - GENERAL**1.1 GENERAL**

- A. Specific administrative and procedural minimum actions are specified in the section, as extensions of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized by an indication by the Architect or Owner that such temporary activity is not required for successful completion of the work and the compliance with requirements of contract documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions and support facilities.
- B. All work and procedures: Conform to NFPA 241-1986, Safeguarding Construction, Alteration, and Demolition Operation Operations.

1.2 LIFTING DEVICES AND HOISTING FACILITIES

- A. Provide cranes, hoists, and other lifting devices necessary for proper and efficient movement of materials. Provide operating personnel required for equipment. Provide with proper guys, bracing, and other safety devices required by local and State Codes.
- B. Remove hoisting equipment when no longer needed.

1.3 TEMPORARY LADDERS, RAMPS, RUNWAYS

- A. Furnish and maintain such equipment as temporary ladders, ramps, scaffolds, runways, chutes, and the like required for proper execution of work by all trades.
- B. Construct and maintain such apparatus, equipment in accordance with labor laws and other applicable state and local codes and regulations.

1.4 CONSTRUCTION SHEDS/STORGE SHEDS

- A. Locate and place construction sheds/storage sheds on property as directed by the Owner. Remove from site at end of project.

1.5 STORAGE OF MATERIALS

- A. Delivery and storage materials for buildings shall be under direct control of the Contractor. Stack, store, or otherwise dispose of on premises when, where, and as directed.
- B. Store and keep protected in a dry and weatherproof enclosure materials which are subject to deterioration by exposure to moisture and the elements.

1.6 TEMPORARY FACILITIES

- A. General Contractor to provide temporary field office of sufficient size to accommodate the needs of the Owner, Architect and the construction personnel office activities and to accommodate project meetings. Provide prefabricated or mobile units with serviceable finishes, temperature controls and foundations adequate for normal loading.

1.7 SANITARY FACILITIES

- A. Temporary toilet facilities shall be provided by the General Contractor at the site to be used by the General Contractor and sub-contractor's construction personnel. Coordinate locations for temporary toilet facilities with Owner prior to mobilization.

1.8 TEMPORARY WATER

- A. The General Contractor shall make necessary arrangements and provide temporary pipe and fittings required during the construction period. The Owner will pay for the cost of the water used for the construction operations.

1.9 TEMPORARY ELECTRIC

- A. The owner will pay for electricity used for the construction operations during the scheduled construction period.
- B. If required, provide all necessary wiring and lamps required for temporary lighting for all trades and for the operation of all the electrical machines.
- C. All temporary wiring shall be done in strict accordance with the regulations of the electric company.

1.10 WEATHER CONDITIONS

- A. In event of temporary suspension of work, or during inclement weather, or whenever further directed by Architect, work and material will be carefully protected against elements. All work of any kind found to be damaged by elements shall be removed and replaced without cost to Owner.

END OF SECTION 01 50 00

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 2. Divisions 2 through 32 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service

performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 2. Completed List: Within 30 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 3. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use CSI Form 13.1A.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

- i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 1 Section "Submittal Procedures."
 - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.
 - 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect

for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. General installation of products.
 - 2. Coordination of Owner-installed products.
 - 3. Progress cleaning.
 - 4. Starting and adjusting.
 - 5. Protection of installed construction.
 - 6. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 1 Section "Submittal Procedures" for submitting surveys.
 - 3. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 - 4. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of **8 feet (2.4 m)** in spaces without a suspended ceiling.

- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. Cutting and patching includes cutting into previously built construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.
1. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed, or for other similar purposes.
 2. Cutting and patching performed during the manufacture of products, or during the initial fabrications, erection, or installation processes is not considered to be cutting and patching under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be cutting and patching.
- B. Refer to other sections of the specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

1.2 QUALITY ASSURANCE

- A. Do not cut and patch structural work in a manner that would result in a reduction of load carrying capacity or of load-deflection ratio.
- B. Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in a manner intended, including energy performance, or that would result in increased maintenance, decreased operational life, or decreased safety.
- C. Do not cut and patch work exposed on the building's exterior or in its occupied spaces in a manner that would, in the architect's opinion, result in lessening the building's aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cut and patch work. Remove and replace work judged by the architect to be cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Except as otherwise indicated, or as directed by the architect, use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal or better performance characteristics.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

3.2 PREPARATION

- A. To prevent failure provide temporary support of work to be cut.
- B. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.
- C. Take precautions not to cut pipe, conduit, or duct that are in use until provisions have been made to bypass them.

3.3 PERFORMANCE

- A. Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect, proceed with cutting and patching at the earliest feasible time and complete work without delay.
- B. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with original installer's recommendations.
 - 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering or chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
 - 2. If required, by-pass utility services such as pipe and conduit, before cutting, where such utility services are required to be relocated. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.
- C. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
 - 1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
 - 2. Restore exposed finishes of patched areas and where necessary extend finish restoration into adjoining work in a manner which will eliminate evidence of patching and refinishing. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coat.

- D. If applicable, where cutting is required of asbestos containing materials that are not scheduled to be abated, the contractor shall take precaution and follow strict requirements outlined in the asbestos abatement specifications. Where required to remove items attached to asbestos containing materials that are not scheduled to be abated, the contractor shall carefully remove such items using methods to minimize disturbance to existing materials to remain. Items to be removed shall be carefully unscrewed / unfastened, etc.

3.4 CLEANING

- A. Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely all paint, mortar, oils, putty, and items of similar nature. Thoroughly clean items and similar features before painting or other finishing is applied. Restore damaged covering to its original condition.

END OF SECTION 01 73 29

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 3. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 4. Advise Owner of changeover in heat and other utilities.
 - 5. Complete final cleaning requirements, including touchup painting.
 - 6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. Expenses incurred by the Architect for more than one reinspection will be the responsibility of the Contractor and will be invoiced directly.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit one copy of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding into the building in order of the room numbers indicated on the Drawings.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - b. Clean exposed hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances.
 - c. Sweep concrete floors broom clean in unoccupied spaces.
 - d. Remove labels that are not permanent.
 - e. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
- C. Comply with safety standards for cleaning. Do not dump debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

- 1. Operation manuals for systems, subsystems, and equipment.
- 2. Maintenance manuals for the care and maintenance of systems and equipment.

- B. Related Sections include the following:

- 1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
- 2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
- 3. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
- 4. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Final Submittal: Submit one of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

- 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Name and address of Architect.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold **8-1/2-by-11-inch (215-by-280-mm)** paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-

- reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
- b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions.
 2. Operating standards.
 3. Operating procedures.
 4. Operating logs.
 5. Wiring diagrams.
 6. Control diagrams.
 7. Piped system diagrams.
 8. Precautions against improper use.
 9. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.

- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.
 - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.

- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."
- D. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 1 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit two set(s) of marked-up Record Prints.
- B. Record Specifications: Submit two copies of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit two copies of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings on site.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Demolition and removal of selected portions of a building or structure.
- 2. Repair procedures for selective demolition operations.

- B. Related Sections include the following:

- 1. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
- B. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property.

Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS

- A. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

- A. Tenants will occupy portions of building immediately adjacent to selective demolition areas. Conduct selective demolition so Tenants will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will create excessive disturbance to the Tenants.
- B. Maintain access to existing walkways, doorways, and other adjacent occupied or used facilities.
 - 1. Do not close or obstruct walkways, doorways, or other occupied or used facilities without written permission from authorities having jurisdiction and the Owner.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Storage or sale of removed items or materials on-site will not be permitted.
- E. Hazardous Materials: Hazardous materials, if present shall be the responsibility of the building owner. Do not disturb hazardous materials or items suspected of containing hazardous materials. The Contractor shall contact the Owner immediately upon discovery of suspect material.

- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to the Architect.
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.

- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by the Owner. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least 72 hours' notice to the Owner if shutdown of service is required.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from the Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
 - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 3. Protect existing site improvements, appurtenances, and landscaping to remain.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to existing areas to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Protect walls and other existing finish work that are to remain or that are exposed during selective demolition operations.

3.4 POLLUTION CONTROLS

- A. Dust Control: Limit the spread of dust and dirt. Comply with governing environmental-protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding and pollution.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows.
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above before disturbing the next lower areas below.
 - 2. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 3. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 4. Dispose of demolished items and materials promptly.
 - 5. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
- B. Existing Facilities: Protect existing, stairs, walkways, building entries, and other building facilities during selective demolition operations.
- C. Removed and Reinstalled Items: Comply with the following:
 - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching."
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 - 1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 SELECTIVE DEMOLITION SCHEDULE

- A. Scope of Selective Demolition is indicated on the Drawings.

END OF SECTION 02 41 19

SECTION 025800 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

This work shall consist of applying white, blue or yellow traffic paint.

Removal of traffic stripes and markings consists of the removal of white or yellow stripes or solid areas, letters, arrows, and other symbols from bituminous concrete and Portland cement concrete surfaces.

- A. Pavement Stripes or Markings
- B. Surface Preparation
- C. Opening to Traffic

1.2 REFERENCE STANDARDS

- A. Comply with the State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, latest edition.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pavement Stripes or Markings Paint
 - 1. Acrylic Traffic Paint. Low VOC acrylic waterborne traffic paint for traffic stripes or traffic markings shall be a white or a yellow ready-mixed pigmented binder which is a solvent-borne, high solid, lead free formulation. The paint shall not contain methylene chloride or 1,1,1-trichloroethane.

2.2 EQUIPMENT

The epoxy striping unit shall be so designed, equipped, maintained, and operated that the material is properly applied in variable widths at a consistent temperature. The equipment for applying thermoplastic material shall be capable of providing continuous mixing and agitation of the material.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

The contractor shall remove, immediately prior to striping or marking the pavement surface, all dirt, oil, grease, existing types of traffic stripes or traffic marking, and other foreign material, including curing compound on new Portland cement concrete, from the surface areas on which the various traffic stripes or traffic marking are to be placed. The pavement shall be cleaned 1 foot beyond the perimeter of where the stripe or marking is to be placed.

The contractor shall apply a primer-sealer conforming to Connecticut DEP volatile organic content (VOC) requirements to the area of bituminous concrete surface, when recommended by the manufacture, and to the areas of Portland cement concrete surfaces where long-life thermoplastic traffic marking are to be placed.

3.2 APPLYING PAINT AND BEADS

- A. Acrylic Traffic Paint. The contractor shall apply acrylic traffic stripes or traffic marking when the ambient and surface temperatures are above 50°F and rising. The acrylic traffic paint shall be applied in a wet film thickness of 150 ± 25 micrometers where traffic stripes are required for 14 days or less. The traffic paint shall be applied in a wet film thickness of 280 ± 25 micrometers where traffic stripes or traffic stripes or marking are to be visible to traffic 15 days and beyond, or when stripes or markings are to be placed on intermediate pavement layers to be opened to traffic due to stage construction.

When traffic stripes or traffic markings are required to remain visible beyond 14 days, the contractor shall apply, prior to acceptance and when directed, additional applications of acrylic traffic paint and glass beads. These applications shall be applied at least 15 days after the initial application and after any sawing or sealing of joints in the bituminous concrete overlay.

3.3 OPENING TO TRAFFIC

The contractor shall complete each application of all types of traffic stripes or traffic markings and allows them to thoroughly dry before opening to traffic.

Should ambient and surface temperatures be below the minimums specified for various materials, with approval, traffic stripes or traffic markings may be placed at temperatures as low as 2 degree C in order to open the traveled way to traffic. Placement of long-life epoxy resin or thermoplastic may be delayed for up to four days after paving.

As a minimum, center lines on undivided roadways and broken lines between lanes shall be delineated before the traveled way is opened. Unless directed, temporary pavement markers shall be used for the interim delineation until permanent stripes and markings are applied. The Engineer will determine when the traveled way is to be opened to traffic.

END OF SECTION 02580

SECTION 027410 - ASPHALT SURFACE TREATMENTS AND SEALCOAT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 2 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Asphalt surface treatments and sealcoat.
 - 2. Crack and Joint Sealant.
 - 3. Pavement-markings.
- B. Related Sections:
 - 1. Division 02 Section "General - Sitework" for general requirements.

1.3 SUBMITTALS

- A. Asphalt Seal Coat:
 - 1. Submit materials certificate to the Owner, which is signed by the Contractor, certifying that materials comply with, or exceed the requirements herein. One materials certificate shall be submitted for each batch plant furnishing materials. Submittal shall be within 14 days of application.
 - 2. Sealcoat design shall be 100% consistent with the requirements of the regulatory agency in which the project is located and as approved by the Owner.
 - 3. Submit Weather Data Field Report within 10 days of asphalt sealcoat completion and prior to final payment for the work.
- B. Pavement Markings
 - 1. Submit materials certificate to the Owner, which is signed by the Contractor, certifying that materials comply with, or exceed the requirements herein. Submittal shall be within 14 days of pavement marking installation.
 - 2. Submit Weather Data Field Report within 10 days of pavement marking completion and prior to final payment for the work.

1.4 QUALITY ASSURANCE

- A. Asphalt Sealcoat
 - 1. Installer Qualifications: Asphalt sealcoat contractors are required to obtain all licenses, permits and fees necessary to perform the application of seal coating as required by federal, state, or local governing authority in the area in which the project is located. The costs of any necessary licensing shall be the responsibility of the Contractor and included in the price or unit price of the work.
 - 2. Sealcoat Installer Experience:
 - a. Evidence of previously completed satisfactory work shall be presented as requested by the Owner.
 - 3. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the regulatory authority having jurisdiction and State Department of Transportation for asphalt paving work.
- B. Pavement Marking
 - 1. Installer Qualifications: Pavement marking contractors shall have completed similar projects and shall hold all necessary licenses, permits and fees necessary to perform the work. Evidence of previously completed satisfactory work shall be presented as requested by the Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Deliver Sealcoat material to the Project site in the tanker supplied by the manufacturer w/ unbroken seals bearing the manufacturer's labels with brand name, type of material, date of production, & directions for onsite handling & storage. Material delivered to a Project site with a broken seal will be rejected. Owner's personnel at the site must verify unbroken seal before any application may proceed.
- C. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Tenant activities: All surface treatments, sealcoat, and pavement marking work shall at all times not interfere with normal tenant activities.
 - 1. All work schedules and scheduled closures of any areas of the site must be approved by Owner before beginning work.
 - 2. All work areas must be clearly delineated with construction barricades to allow customers free access to the facility and to direct vehicular traffic to areas not under construction.
 - 3. Areas barricaded for construction must be 100% complete prior to opening for public access.
- B. Environmental Limitations: Do not apply asphalt materials if sub-grade is wet or excessively damp, during rainy weather, if rain is imminent or expected before time required for adequate cure, if the sub-grade or base course is frozen or if the air temperature, measured in the shade away from artificial heat at the location of the paving operations does not meet:
 - 1. Asphalt Crack Seal (polymer-modified bituminous sealant): Ambient temperature of at least 40 deg F (5 deg C) and rising, with no fog or dew present. Early morning applications shall be performed in direct sunlight.
 - 2. Asphalt Surface Treatments and Sealcoat:
 - a. Minimum surface temperature of 50 deg F (10 deg C) and rising for a period of 24 hours after application. Do not apply if rain is imminent within 8 hours or when relative humidity exceeds 85%.
 - b. Do not apply sealcoat when dew point and temperature are within 5 degrees F.
 - c. Do not apply sealcoat when temperature is 90 degrees F and above without first cooling the surface with a fine mist of water (fogging). Fogging should only be performed to provide a damp surface without causing any runoff.
 - d. All storm water or utility inlets, structures, manhole covers, access covers, concrete aprons, etc shall be protected during installation.
 - e. Stormwater inlets shall be covered with fabric inlet protection to absolutely protect surface water from contamination by the sealcoat material and paint before becoming dry.
- C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials, and 55 deg F (12.8 deg C) for water-based materials, and not exceeding 90 deg F (32 deg C).

PART 2 - PRODUCTS

2.1 ASPHALT MATERIALS

- A. Asphalt Seal Coat Equipment:
 - 1. Self-propelled squeegee equipment shall have at least two squeegee or brush devices (one behind the other) to assure adequate distribution and penetration of sealer into the bituminous pavement. Equipment shall have continuous agitation or mixing capabilities to maintain homogenous consistency of pavement sealer mixture throughout the application process.
 - 2. Pressurized spray application equipment shall be capable of spraying pavement sealer with sand added. Equipment shall have continuous agitation or mixing capabilities to maintain homogenous consistency of pavement sealer mixture throughout the application process.
 - 3. Hand squeegee and brushes shall be acceptable only in areas where practicality prohibits the use of mechanized equipment.

- B. Asphalt Surface Treatments - Seal Coat: Material shall be as selected by the Owner and as permitted in the jurisdiction in which the project is located.
1. Sealmaster Polymer Modified MasterSeal (PMM) is to be used where specified and approved by the Owner, and in conformance with the following specifications:
 - a. Material shall be homogeneous and show no separation or coagulation that cannot be overcome by moderate stirring.
 - b. Non Violates: 43% - 47%
 - c. Ash Non Violates: 42% - 52%
 - d. Solubility of non Violates in CS₂: 20 min.
 - e. Specific Gravity: 25C – 1.15 – 1.25
 - f. Drying Time: 8 hours max.
 - g. Adhesion and Resistance to Water: No penetration or loss of adhesion
 - h. Resistance to Heat: No blistering or sagging
 - i. Flexibility: No cracking or flaking
 - j. Resistance to Impact: No chipping, flaking or cracking
 - k. Resistance to Volatilization: 10% loss in weight maximum
 - l. Wet Film Continuity: Smooth non-granular free from coarse particles
 2. Oil Spot Treatment: SealMaster PetroSeal or prep seal oil spot primer as specified by the manufacturer for pavement sealer.
 3. Water: specified material does not require onsite dilution so adding water is not allowed.
 4. Silica Sand: at a rate of 4lbs/gallon, meeting the AFS specification of 40-60 mesh.
 5. Fast Sealing Additive (drying agent) is allowed.

2.2 AUXILIARY MATERIALS

- A. Crack and Joint Sealant:
1. ASTM D 6690 or AASHTO M 324, Type I, Type II, Type III or Type IV hot-applied, single-component, polymer-modified bituminous sealant. It shall be the responsibility of the Contractor to determine which Type is applicable to the climate conditions of the site location.
 2. Crack and Joint Sealant as approved by the Owner. Permitted manufacturers include; Crafcro Parking Lot Sealant, Crafcro Parking Lot Sealant I, Crafcro Superflex and SealMaster Hot Pour Crack Sealant and SealMaster Crack Master Parking Lot Grade.
- B. Pavement-Marking Paint: Acrylic water-based pavement marking type complying with Federal Specification TTP-1952 D and alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248.
1. Color: As indicated on plan, per original plan or as directed by Owner.
 2. Materials:
 - a. Acceptable Products or approved equal:
 - 1) Sherwin Williams Setfast Non-lead Chlorinated Rubber Zone Marking Paint – White TMS5126; Yellow TM5127.
 - 2) Sherwin Williams Setfast Low VOC Acrylic Traffic Marking Paint – White TM 5626; Yellow TM 5627.
 - 3) Sherwin Williams Hotline Fast Dry Latex Traffic Marking Paint – White TM 2152; Yellow TM 2153.
 - 4) Sherwin Williams Setfast Latex Traffic Marking Paint- Red TM2132; Blue TM2133, Black TM2135.

2.3 MIXES

- A. Asphalt Seal Coat Mix Design
1. PMM Sealer Concentrate: -100 Gallons
 2. Silica Sand – 400 pounds meeting 40 - 70 fineness rating (AFS)
 - a. Black Beauty Slag Sand (with comparable sieve rating) where allowed by local jurisdiction where the project is located may be substituted when silica sand is not available.
 3. Water – Specified material does not require onsite dilution
 4. Curing Agents – use in high traffic areas where applicable

PART 3 - EXECUTION

3.1 SURFACE TREATMENTS & SEAL COAT

A. Surface Preparation:

1. Surface must be free from dirt, dust, weeds and includes grass along the edges. Remove and dispose of any loose and unsuitable materials, dirt, weeds, and debris from pavement surface by power blower or mechanical sweeping equipment.
2. Mechanically clean and hot lance existing joints such that they are free of all vegetation and moisture.
3. Surface cracks up to 1" inch must be filled with crack filler as specified.
4. Treat all grease, oil and gasoline spots with compatible primer of the manufactured coating. In hot weather, the surface should be fogged with water prior to sealing.
5. Prior to spreading pavement sealer, remove all pavement marking lines and symbols with a motorized abrasive device.
6. Contractor to dispose of all cans, bags, and leftover materials off-site.

B. Execution:

1. Mix pavement sealer in accordance with the manufacturer's procedure to a uniform consistency before using. When the rubberized mixture has thickened, add sand or aggregate slowly to the mixing tank. Mix thoroughly before and slowly during the application.
 - a. First coat at a rate of .13 gallons per square yard/coat. At no time are total coats to exceed 0.51 gallons per square yard. The first coat may be applied by hand squeegee, self propelled squeegee equipment or pressurized spray equipment. Hand squeegee or self propelled squeegee equipment is preferred.
 - b. Second coat at a rate of .13 gallons per square yard/coat. At no time total coats are to exceed 0.51 gallons per square yard. The second coat must be applied with pressurized spray equipment.
2. Allow a minimum of 24 hours curing time before allowing traffic over treated surface.
3. It is the Contractor's responsibility to verify all local and state regulations regarding application of pavement markings including all local zoning codes & regulations.

3.2 PAVEMENT MARKING

A. Application:

1. Removal of Existing Markings:

- a. Existing pavement marking lines and symbols shall be removed prior to surface treatment with seal coat or where build-up of several previous coats prevent adequate application of new markings
 - b. Removal shall not cause damage to surface of existing pavement beyond what is necessary to remove the existing markings. Any excessive damage caused by removal of existing markings shall be the responsibility of the Contractor and shall be repaired at no cost to the Owner.
 - c. A motorized abrasive device shall be used to remove existing markings.
 - d. Pavement marking removal within public right-of-way shall be completed under the supervision of and in conformance with authority having jurisdiction and according to plans and specifications.
2. Proceed with pavement marking only on clean dry surfaces with a minimum ambient or surface temperature of 50 degrees F not exceeding 90 degrees F and relative humidity at a maximum of 85%.
 3. Apply paint material at manufacturer's recommended rates and provide a minimum wet film thickness of 15 mils and dry film thickness of 10 mils per coat. Material shall have a uniform thickness and smooth surfaced cross-section throughout its entire length.

B. Surface Preparation

1. Surface shall be clean and free of dirt, grease, oil, or other contaminants which could interfere with adhesion.

C. Execution:

1. Lines, stencils, and markings shall be repainted in original locations unless otherwise directed by the Owner, and in accordance with this specification.
2. Apply paint material at manufacturer's recommended rates and provide a minimum wet film thickness of 15 mils and dry film thickness of 10 mils per coat. Material shall have a uniform thickness and smooth surfaced cross-section throughout its entire length.

3. Allow any new asphalt pavement to age for a minimum of 48 hours before painting. Allow any surface treatment with new seal coat to age/cure for a minimum of 24 hours prior to application of paint.
4. For new pavement or existing pavement where all previous markings have been removed or existing pavement treated with sealcoat paint shall be applied in two (2) coats using a template or striping machine.
5. For existing pavement when existing paint is not removed paint shall be applied in one (1) coat using a template or striping machine matching exact perimeter of existing markings.
6. Stripes shall be a minimum width of 4 inches unless otherwise indicated on the Drawings.
7. All lines and markings shall be per original drawings except that no "STOP" markings shall be re-applied unless otherwise directed by the Owner or required by AHJ. All finished lines and markings shall be neat and even with well defined edges with straight lines and uniform curves.

END OF SECTION 027410

SECTION 049010 - CLAY MASONRY RESTORATION AND CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes restoration and cleaning of brick as follows:
 - 1. Repointing mortar joints.
 - 2. Cleaning exposed clay masonry surfaces.

1.2 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- B. Medium-Pressure Spray: 400 to 800 psi (2750 to 5500 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use.
- B. Samples: For each exposed material required for replacing or repairing existing materials.
- C. Qualification Data: For restoration specialists.

1.4 QUALITY ASSURANCE

- A. Mockups: Prepare mockups of restoration and cleaning as follows to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Clean an area approximately 25 sq. ft. (2.3 sq. m) in area for each type of clay masonry and surface condition.
 - 2. Rake out joints in two separate areas approximately 36 inches (900 mm) high by 72 inches (1800 mm) wide for each type of repointing required and repoint one of the two areas.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

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

2.2 MASONRY MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
 1. Provide white cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Sand: ASTM C 144, unless otherwise indicated.
 1. Color: Provide natural sand of color necessary to produce required mortar color.
 2. For pointing mortar, provide sand with rounded edges.
 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands, if necessary, to achieve suitable match.
- D. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes.
- E. Water: Potable.

2.3 CLEANING MATERIALS

- A. Water for Cleaning: Potable.
- B. Hot Water: Heat water to a temperature of 140 to 160 deg F (60 to 71 deg C).
- C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.
- D. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate (TSPP), 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.
- E. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing organic soiling from polished stone, brick, aluminum, plastics, and wood.
 1. Products:
 - a. Dominion Restoration, Inc.; Bio-Cleanse.
 - b. Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.
 - c. Price Research, Ltd.; Price Non-Acid Masonry Cleaner.
 - d. ProSoCo; Enviro Klean Restoration Cleaner.

2.4 MISCELLANEOUS MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
1. Products:
 - a. American Building Restoration Products, Inc.; LM 130 Acid Shield.
 - b. Diedrich Technologies Inc.; Diedrich Acid Guard.
 - c. Price Research, Ltd.; Price Mask.
 - d. ProSoCo; Sure Klean Strippable Masking.

2.5 MIXES

- A. Mortar Mixes: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Mix materials in a clean, mechanical batch mixer.
1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
 2. Mortar Pigments: Do not exceed a pigment-to-cement ratio of 1:10 by weight.
- B. Do not use admixtures of any kind in mortar, unless otherwise indicated.
- C. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand.
1. Add mortar pigments to produce mortar colors required.
- D. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N, unless otherwise indicated; with cementitious material content limited to portland cement and lime.
- E. Chemical Cleaning Solutions: Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical cleaner manufacturer.
1. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of 3 percent or less.
 2. Acidic Cleaner Solution for Terra Cotta: Dilute with water to concentration demonstrated by testing that does not etch or otherwise damage terra cotta surface.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

- B. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that resist chemical cleaners used unless chemical cleaners will not damage surfaces. Use materials that contain only waterproof, UV-resistant adhesives. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Keep wall wet below area being cleaned to prevent streaking from runoff.

3.2 CLEANING

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
- B. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Do not use wire brushes.
 - 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip.
 - 3. For chemical cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
 - 4. For water spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
- C. Removing Plant Growth: Completely remove plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.
- D. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical cleaner manufacturer's written instructions; use brush or spray application methods, at Contractor's option. Do not spray apply at pressures exceeding **50 psi (345 kPa)**. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
- E. Detergent Cleaning: Use for brick.
 - 1. Wet masonry with cold water applied by low-pressure spray.
 - 2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing.
 - 3. Rinse with cold water applied by low -pressure spray.
- F. Mold, Mildew, and Algae Removal:
 - 1. Wet masonry with cold water applied by low-pressure spray.
 - 2. Apply mold, mildew, and algae remover by brush.
 - 3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing.
 - 4. Rinse with cold water applied by medium-pressure spray.

3.3 REPOINTING MASONRY

A. Rake out and repoint mortar joints as follows:

1. Remove mortar from joints to depth of joint width plus **1/8 inch (3 mm)**, but not less than **1/2 inch (13 mm)** or not less than that required to expose sound, unweathered mortar. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar.
2. Cut out mortar by hand with chisel and mallet.
3. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and mallet. Strictly adhere to written quality-control program. Quality-control program shall include provisions for demonstrating ability of operators to use tools without damaging masonry, supervising performance, and preventing damage due to worker fatigue.
4. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing.
5. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than **3/8 inch (9 mm)**. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer. Where existing bricks have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces.
6. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.

B. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.

1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.

3.4 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

END OF SECTION 049010

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All rough and finished carpentry are included under this Section of the Specifications, unless specifically noted otherwise.
- B. Furnish and erect all wood blocking, studs, sheathing, etc., as required for complete framing job, (Where sleeves are required, they shall be delivered by those trades involved and set by them). The general Contractor shall assume full responsibility for properly coordinating all of the work. Grab bars shall withstand not less than 300 lb force.
- C. Install all toilet accessories furnish under Section 10800 Accessories. Provide all necessary blocking to receive same, taking particular attention with the anchoring of grab bars, which must be reliable as is customary for good work, but especially so for the expected use in this type of project.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. "Grade Mark", "Trade Mark" A and Mill Identification Mark" of the Association having jurisdiction shall appear on each piece of framing lumber when delivered to the job site.
- B. Plywood shall conform to the U.S. Department of Commerce, Commercial Standard CS45-60 and shall branded or stamped with grade.
- C. Structural Lumber shall be as Follows:
 - 1. Light framing lumber used for studs, partitions, and miscellaneous framing shall not be less than standard grade and shall have the following minimum allowable unit stresses:
 - 2. Extreme fiber in bendingFb = 550 PSI
Tension parallel to grainFt = 375 PSI
Compression parallel to grainFc = 1,350 PSI
Modulus of elasticityE = 1,400,000 PSI
 - 3. Nailing shall be as per article 23 of the Connecticut Building Code/2005
- E. The general contractor shall furnish, in place, all necessary blocking as may be required by all other trades.
- F. All lumber shall bear the grade marks and mill identification.
- G. Identify all plywood as to species grade and glue type by the stamp of the American Plywood Association (APA)
- H. All plywood shall be manufactured from a Group 1 or Group 2 species.

- I. Provide APA performance rated panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.

PART 3 - EXECUTION

3.1 STORAGE AND PROTECTION

- A. Protect lumber, against all dampness or damage of any character during and after delivery. Store under cover in a well-ventilated building.

3.2 WORKMANSHIP

- A. All workmanship shall be of the highest caliber. All studs for shall be nominal 2" x 6" or 2" x 4, 16" o.c., as shown; doubled at all openings and tripled at corners. Brace, plumb, and level all members and secure with sufficient nailing to insure rigidity.
- B. Arrange plates to form continuous ties; stagger ends of all double plates and securely splice at abutting corners.
- C. Provide proper blocking required to support and anchor the bathtubs.
- D. Except where otherwise shown, double headers and trimmers shall be installed.
- E. Nails shall be sized to be in length 2 ½ times the thickness of the material which is to be fastened.
- F. Provide blocking for and install all finish hardware, bathroom accessories, etc.

3.3 INSTALLATION OF PLYWOOD

- A. Place all plywood with face grain perpendicular to supports and continuous over at least two supports. Center joist accuracy over supports and stagger the end joints.
- B. Allow 1/8" spacing at panel ends and ¼" at panel edges for square edge panels.
- C. Supply and install all wood blocking as required at plywood openings and end joints.

END OF SECTION 06 10 00

SECTION 064020 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Interior ornamental work.
2. Plastic-laminate cabinets.
3. Plastic-laminate countertops.
4. Shop finishing of interior woodwork.

- B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass units inserted into check desks and other millwork.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

- A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.

- B. Samples for Verification:

1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.

2. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish, with edge banding on 1 edge.
 3. Solid-surfacing materials, 6 inches (150 mm) square.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species for Opaque Finish: Any closed-grain hardwood.
- C. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Softwood Plywood: DOC PS 1.
- D. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Nevamar Company, LLC; Decorative Products Div.
 - b. Wilsonart International; Div. of Premark International, Inc.
 - 2. Colors and Patterns: As indicated on Drawings.
- F. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dupont, Corian Products.
 - 2. Type: Standard type, unless Special Purpose type is indicated.
 - 3. Colors and Patterns: As indicated on Drawings.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets as indicated on drawings."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening; self-closing.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- E. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- G. Shelf Rests: BHMA A156.9, B04013; metal.
- H. Drawer Slides: BHMA A156.9, B05091.
 - 1. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated steel with polymer rollers.
 - 2. Box Drawer Slides: Grade 1; for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
 - 3. File Drawer Slides: Grade 1HD-100; for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
 - 4. Pencil Drawer Slides: Grade 2; for drawers not more than 3 inches (75 mm) high and 24 inches (600 mm) wide.
 - 5. Keyboard Slides: Grade 1; for computer keyboard shelves.
 - 6. Trash Bin Slides: Grade 1HD-100; for trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Grommets for Cable Passage through Countertops: 2 1/2-inch OD, Color-white, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide model # EDPAD1 by Doug Mockett & Company, Inc.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

2.3 MISCELLANEOUS MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior

walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

- B. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members **3/4 Inch (19 mm)** Thick or Less: **1/16 inch (1.5 mm)**.
 - 2. Edges of Rails and Similar Members More Than **3/4 Inch (19 mm)** Thick: **1/8 inch (3 mm)**.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- F. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Custom.
- B. Wood Species: Any closed-grain hardwood.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

2.6 PLASTIC-LAMINATE CABINETS

- A. Grade: Custom.
- B. AWI Type of Cabinet Construction: Flush overlay or as indicated on drawings.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edges: PVC tape, **0.018-inch (0.460-mm)** minimum thickness, matching laminate in color, pattern, and finish.
- D. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels; **black**.
 - a. Edges of Plastic-Laminate Shelves: PVC tape, **0.018-inch (0.460-mm)** minimum thickness, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of thermoset decorative panels.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated on Drawings.

2.7 PLASTIC-LAMINATE COUNTERTOPS

- A. Grade: Custom.
- B. High-Pressure Decorative Laminate Grade: HGS.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated on Drawings.
- D. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- E. Core Material: Particleboard.
- F. Core Material at Sinks: Particleboard made with exterior glue.

2.8 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. Shop Priming: Shop apply the prime coat including backpriming, if any, for items specified to be field finished. Refer to Division 9 painting Sections for material and application requirements.
- D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
- E. Opaque Finish:
 - 1. Grade: Custom.
 - 2. AWI Finish System: Nitrocellulose lacquer.
 - 3. Color: As indicated on Drawings.
 - 4. Sheen: Flat, 15-30 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of **1/8 inch in 96 inches (3 mm in 2400 mm)**.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than **36 inches (900 mm)** long, except where shorter single-length pieces are necessary.
1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 3. Install standing and running trim with no more variation from a straight line than **1/8 inch in 96 inches (3 mm in 2400 mm)**.
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than **16 inches (400 mm)** o.c. with No. 10 wafer-head screws sized for **1-inch (25-mm)** penetration into wood framing, blocking, or hanging strips.
- H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 2. Install countertops with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line.
 3. Secure backsplashes to tops with concealed metal brackets at **16 inches (400 mm)** o.c. and to walls with adhesive.
 4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- I. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Insulation under slabs-on-grade.
- 2. Concealed building insulation.
- 3. Foundation insulation.

- B. Related Sections include the following:

- 1. Division 9 Section "Gypsum Board Assemblies" and "Gypsum Board Shaft-Wall Assemblies" for installation in metal-framed assemblies of insulation specified by

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.
- D. Research/Evaluation Reports: For foam-plastic insulation.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

4. Approved For Plenums.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Extruded-Polystyrene Board Insulation:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.
 - c. Owens Corning.
 - d. Tenneco Building Products.
 2. Glass-Fiber Insulation:
 - a. CertainTeed Corporation.
 - b. Johns Manville Corporation.
 - c. Knauf Fiber Glass.
 - d. Owens Corning.
 3. Mineral Wool Fiber Insulation:
 - a. Roxul Inc.
 4. Polyurethane Foam:
 - a. Bay Systems
 - b. Fomo Products Inc.

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Extruded-Polystyrene Board Insulation: ASTM C 518, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:
 - 1. R-Value: 1.5 minimum.
 - 2. Type: HPU, High Performance Underlayment.
- C. Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- D. Faced Mineral-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on one face; consisting of fibers manufactured from glass.
- E. Mineral Wool Fiber Insulation: ASTM C 612, Type IVB, unfaced, non-combustible, semi-rigid, and water repellent boards for use in cavity wall applications. Maximum flame spread and smoke development indices of zero (0) for each, with min. R-value of 4.2 per inch. Basis of design: CavityRock as manufactured by Roxul Inc.
- F. Polyurethane Foam: Closed cell spray applied urethane foam. Two component, medium density, structural insulation system. Basis of design: BaySeal CC as manufactured by Bay Systems or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not indicated, extend insulation a minimum of **24 inches (610 mm)** below exterior grade line.
- B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to insulation manufacturer's written instructions.
- C. Protect top surface of horizontal insulation from damage during concrete work by applying protection board.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

- D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. For metal-framed wall cavities where cavity heights exceed **96 inches (2438 mm)**, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
- E. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately **2.5 lb/cu. ft. (40 kg/cu. m)**.
- F. Install semi-rigid mineral wool fiber insulation with self-adhering insulation hangers adhered to exterior sheathing. The Self-Adhering Insulation Hangers shall have a 12ga. (.106") diameter mild steel spindles with a corrosion resistant coating. The base plate shall be 2" square and made of galvanized steel with a pre-applied, pressure-sensitive adhesive protected by a release paper. Basis of design: Tactoo Self-Adhering Insul-Hangers as manufactured by AGM Industries.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07 31 13 - FIBERGLASS SHINGLE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fiberglass shingles.
2. Underlayment.
3. Ridge Vents.
4. Accessories.

B. Related Sections:

1. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings counterflashings, flashings and roof edge drainage systems.

1.3 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of fiberglass shingle and ridge vent indicated.
 1. Include similar Samples of trim and accessories involving color selection.
- C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:
 1. Fiberglass Shingle: Full size.
 2. Ridge Vent: 12-inch- (300-mm-) long Sample.
 3. Self-Adhering Underlayment: 12 inches (300 mm) square.
- D. Qualification Data: For qualified Installer.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.
- F. Maintenance Data: For each type of fiberglass shingle to include in maintenance manuals.
- G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain ridge and hip cap shingles ridge vents felt underlayment and self-adhering sheet underlayment from single source from single manufacturer.
- C. Install roofing and accessories capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Speed – 110 mph, Class 1-90
- D. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.
- E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
 - 1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
 2. Material Warranty Period: 30 years from date of Substantial Completion.
 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 110 mph for 30 years from date of Substantial Completion.
 4. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor 20 years from date of Substantial Completion.
- B. Special Project Warranty: Roofing Installer's Warranty, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Architectural Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
 1. Manufacturers: The basis of design for the asphalt shingles is the following:
 - a. GAF Materials Corporation – Timberline HD
 2. Strip Size: Manufacturer's standard
 3. Algae Resistance: Granules treated to resist algae discoloration.
 4. Color and Blends: As selected by Architect from manufacturer's full range.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match fiberglass shingles.

2.2 UNDERLAYMENT MATERIALS

- A. Felt: 15lb., ASTM D 226 , Type II, asphalt-saturated organic felts, nonperforated.

- B. Self-Adhering Sheet Underlayment, Polyethylene Faced, Ice & Water Protection Membrane: ASTM D 1970, minimum of 40-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Coatings & Waterproofing, Inc.
 - b. Grace, W. R. & Co. - Conn.
 - c. Henry Company.
 - d. Johns Manville.
 - e. Owens Corning.

2.3 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips and external deflector baffles; for use under ridge shingles.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Cobra SnowCountry Rigid Ridge Vent by GAF Material Corporation or comparable product by one of the following:
 - a. Air Vent, Inc.; a Gibraltar Industries company.
 - b. Cor-A-Vent, Inc.
 - c. GAF Materials Corporation.
 - d. Lomanco, Inc.
 - e. Mid-America Building Products.
 - f. Obdyke, Benjamin Incorporated.
 - g. Owens Corning.
 2. Minimum Net Free Area: 18 sq. in. per linear feet.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.
1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

2.5 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
 - 1. Step Flashings: Fabricate with a headlap of 2 inches (50 mm) and a minimum extension of 5 inches (125 mm) over the underlying asphalt shingle and up the vertical surface.
 - 2. Drip Edges: Fabricate in lengths not exceeding 10 feet (3 m) with 2-inch (50-mm) roof-deck flange and 1-1/2-inch (38-mm) fascia flange with 3/8-inch (9.6-mm) drip at lower edge.
- C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (100 mm) from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Felt Underlayment (4:12 pitch and over): Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt underlayment nails.
 - 1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches (75 mm) in

- direction to shed water. Lap ends of felt not less than 6 inches (150 mm) over self-adhering sheet underlayment.
2. Install fasteners at no more than 36 inch (900 mm) o.c.
- C. Double-Layer Felt Underlayment (Less than 4:12 pitch): Install on roof deck parallel with and starting at the eaves. Install a 19-inch- (485-mm-) wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches (485 mm) in shingle fashion. Lap ends a minimum of 6 inches (150 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt underlayment nails.
1. Install felt underlayment on roof sheathing not covered by self-adhering sheet underlayment. Lap edges over self-adhering sheet underlayment not less than 3 inches (75 mm) in direction to shed water.
 2. Terminate felt underlayment extended up not less than 4 inches (100 mm) against sidewalls, curbs, chimneys, and other roof projections.
 3. Install fasteners at no more than 36 inch (900 mm) o.c.
- D. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below and on Drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
1. Eaves: Extend from edges of eaves 24 inches minimum beyond interior face of exterior wall.
 2. Valleys: Extend from lowest to highest point 18 inches minimum on each side.
 3. Sidewalls: Extend beyond sidewall 18 inches, and return vertically against sidewall not less than 4 inches .
 4. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches, and return vertically against penetrating element not less than 4 inches
 5. Roof Slope Transitions: Extend 18 inches on each roof slope.

3.3 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

- B. Step Flashings: Install with a headlap of 2 inches (50 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
 - 1. Adhere 9-inch- wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.
- C. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.
- D. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.
- E. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 FIBERGLASS SHINGLE INSTALLATION

- A. General: Install fiberglass shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip at least 7 inches (175 mm) wide with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 1/2 inch (13 mm) over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.
- C. Install first and remaining courses of shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install first and remaining courses of shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- E. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- F. Fasten shingle strips with roofing nails located according to manufacturer's written instructions as required to achieve specified warranties including wind warranties.
- G. Closed-Cut Valleys: Extend shingle strips from one side of valley 12 inches (300 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2 inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
 - 1. Do not nail shingles within 6 inches (150 mm) of valley center.
 - 2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.

- H. Ridge Vents: Install continuous ridge vents over shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- I. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 - 1. Fasten ridge cap shingles to cover ridge vent without obstructing airflow.

END OF SECTION 07 31 13

SECTION 07 46 40 – VINYL SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Vinyl horizontal siding.
- B. Vinyl soffits.
- C. Accessories and trim.

1.2 RELATED SECTIONS

- A. Section 07210 – Building Insulation.
- B. Section 07900 - Joint Sealers.

1.3 REFERENCES

- A. ASTM D 3679 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.
- B. ASTM D 4477 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Soffit.
- C. ASTM D 5206 - Standard Windload Resistance Test.
- D. ASTM E 84 - Standard test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.4 DESIGN/PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Code compliance in accordance with the following:
 - 1. 2005 Connecticut State Building including 2009 amendments.
 - 2.
- B. PVC Fire Resistance: Provide vinyl siding products that meet or exceed the following ratings:
 - 1. Flame Spread Index < 25, smoke development rating <450, per ASTM E 84.
 - 2. Fire endurance classification of 1 hour, per ASTM E 119 as wall assembly.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.

- 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.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 12 inches (300 mm) long, representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Provide installer with not less than three years of experience with products specified or similar products.
- B. Mock-Up: Provide a mock-up for evaluation of installation techniques and workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship and color is approved by Architect.
 - 3. Reinstall mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation. Refer to manufacturer's installation instructions for specific storage and handling requirements.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

- A. Provide manufacturer's standard lifetime limited warranty on siding products, transferable to new owners.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: CertainTeed Corporation, Siding Products Group.
- B. Substitutions: As approved by Architect.

2.2 MATERIALS

- A. Vinyl Siding, Soffit and Components: Provide products made of extruded polyvinyl chloride as specified in this section and manufactured to comply with requirements of ASTM D 3679.
 - 1. Provide elongated nailing slots on nailing flanges to allow for movement.
 - 2. Factory-notch ends of horizontal panels to form overlapping joints.
 - 3. Provide products that meet weathering requirements of ASTM D 3679.

2.3 VINYL SIDING

- A. Basis of Design Product: Monogram 46 D4:
 - 1. Design: Double 4 inch (102 mm) clapboard; rough cedar finish with STUDfinder Installation System.
 - 2. Nail Hem: RigidForm 220 Technology Roll Over Nail Hem.
 - 3. Lock: CertiLock self aligning post formed positive lock.
 - 4. Width: 8 inch (203 mm).
 - 5. Length: 12 feet 6 inches (3.81 m) plus or minus .025 inch (6 mm).
 - 6. Average Thickness: 0.046 inch (1.17 mm).
 - 7. Panel Projection: 3/4 inch (19 mm).
 - 8. Panel Exposure: 4 inch (102 mm) plus or minus .062 inch (1.57 mm).
 - 9. Maximum Warp (per 2 panels): 0.250 inch (6 mm).
 - 10. Color: As selected by Architect from manufacturer's standards. Up to two colors may be selected for the project.

2.4 2.5 VINYL SOFFITS

- A. A. Basis of Design Product: Value T4 soffit, center vented.
 - 1. Design: Triple 4 inches (102 mm); center vented, matte finish.
 - 2. Width: 12 inches (305 mm) plus or minus .062 inch (1.57 mm).
 - 3. Length: 12 feet (3.66 m) plus or minus .025 inch (6 mm).
 - 4. Average Thickness: 0.036 inch (0.9 mm).
 - 5. Exposure: 4 inches (102 mm) single nailing hem.
 - 6. Maximum Warp (per 2 panels): 0.250 inch (6 mm).
 - 7. Color: As selected by Architect from manufacturer's standards.
- B. Soffit Accessories:
 - 1. J-Channel: 3/8 inch (10 mm), 1/2 inch (13mm) and 3/4 inch (19mm) by 12 feet, 6 inch (3.81 m) length, for vertical and eave applications.
 - 2. F-Channel: 5/8 inch (15.88 mm) and 3/4 inch (19 mm) by 12 feet 6 inches (3.81 m) length.
 - 3. Soffit H-Bar: 3/8 inch (10 mm) , 1/2 inch (13 mm) or 3/4 inch (19 mm) by 12 feet, 6 inches (3.81 m) length, for horizontal and eave applications.
 - 4. Soffit Cove Trim: 1/2 inch (12.7 mm) by 12 feet, 6 inches (3.81 m) length.
 - 5. Color: As selected by Architect from manufacturer's standards.

2.5 VINYL ACCESSORIES

- A. Standard Accessories:

1. 1. Corner post: Standard width, 10 feet (3.05 m), 12 feet (3.66 m), and 20 feet (6.10 m) lengths.
 2. J-Channel: Standard width, 12 feet, 6 inches (3.81 m) length.
 3. Undersill trim: ¾" face, 12 feet, 6 inch (3.81 m) length.
 4. Dual undersill trim: ¾" face, 12 feet 6 inches (3.81 m) length.
 5. 2-1/4 inch (57 mm) Vinyl Starter Strip. (No Color)
 6. Color: As selected by Architect from manufacturer's standards.
- B. Additional Accessories:
1. As indicated on drawings.

2.6 2.7 FASTENERS

- A. A. Provide galvanized or other corrosion-resistant nails as recommended by manufacturer of siding products. Do not install siding with staples.

PART 3 EXECUTION

3.1 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.

3.2 PREPARATION

- A. Examine, clean, and repair as necessary any substrate conditions which would be detrimental to proper installation.
- B. Do not begin installation until unacceptable conditions have been corrected.

3.3 INSTALLATION

- A. Install products in accordance with the latest printed instructions of the manufacturer.
- B. Installer shall have manufacturer's current required credentials.
- C. Install products with all components true and plumb.
- D. Do not install siding with staples.
- D. Allow space between both ends of siding panels and trim for thermal movement. Overlap horizontal panel ends one-half the width of factory pre-cut notches.
- E. Stagger lap joints in horizontal siding in uniform pattern as successive courses of siding are installed.

- F. Install J-channel and flashing to accommodate successive courses of vertical siding. Install wood shims at building corners to bring cut edges of vertical siding out to correct plane.

3.4 PROTECTION

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

3.5 CLEANING

- A. At completion of work, remove debris caused by siding installation from project site.

END OF SECTION 07 46 40

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - a. Roof edge drainage sheet metal fabrications.
 - b. Steep-slope roof sheet metal fabrications.
- B. Related Sections:
 - 1. Division 7 Section "Fiberglass Shingles" for installing sheet metal flashing and trim integral with roofing.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install flashing and roof edge drainage fabrications capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Speed – 110 mph.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 180 deg F material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
1. Identification of material, thickness, weight, and finish for each item and location in Project.
 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 7. Details of special conditions.
 8. Details of connections to adjoining work.
 9. Detail formed flashing and trim.
- C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
 3. Accessories and Miscellaneous Materials: Full-size Sample.
- E. Qualification Data: For qualified fabricator.
- F. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.
- G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

- C. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including gutter, fascia trim, etc., approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

- c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.
 1. Non-Patinated Exposed Finish: Mill.
- C. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 1. Surface: Smooth, flat.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Copper Sheet: Copper, hardware bronze or Series 300 stainless steel.
 3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Solder:
 1. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

- D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

- F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
- H. Do not use graphite pencils to mark metal surfaces.

2.4 ROOF EDGE DRAINAGE SHEET METAL FABRICATIONS

- A. Gutters: Manufactured in uniform one-piece, seamless lengths, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least **1 inch (25 mm)** above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
 - 1. Fabricate from the following exposed metal:
 - a. Formed Aluminum: 0.032 inch thick.
 - 2. Gutter Profile: Style K according to SMACNA's "Architectural Sheet Metal Manual."
 - 3. Corners: Factory mitered and mechanically clinched and sealed watertight.
 - 4. Gutter Supports: Gutter brackets with finish matching the gutters.
 - 5. Gutter Accessories:
 - a. Leaf Guard: Leaf Relief as manufactured by Alcoa Inc. or approved equal.
- B. Downspouts:
 - 1. Corrugated rectangular downspouts at all areas unless noted otherwise, complete with machine-crimped elbows, manufactured from 0.032 inch thick aluminum. Furnish with metal hangers, from same material as downspouts, and anchors. Manufactured by American Construction Metals or approved equal.

2.5 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Step Flashing: Fabricate from the following materials:
 - 1. Copper: 20 oz./sq. ft. thick.
- B. Drip Edges: Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.
- C. Eave and Rake Flashing: Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.
- D. Counterflashing: Fabricate from the following materials:
1. Copper: 20 oz./sq. ft. thick.
- E. Flashing Receivers: Fabricate from the following materials:
1. Copper: 20 oz./sq. ft. thick.
- F. Roof-Penetration Flashing: Fabricate from the following materials:
1. Copper: 20 oz./sq. ft. thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches (50 mm).
- C. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).
- D. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side

edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting

proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
 - 1. Do not solder aluminum sheet.
 - 2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - 3. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.
- G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
 - 2. Provide elbows at base of downspout to direct water away from building.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 16-inch centers.
- C. Pipe Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of interlocking folded seam or blind rivets and sealant.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 078413 - PENETRATION FIRESTOPPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
 - 1. Floors.
 - 2. Roofs.
 - 3. Walls and partitions.
 - 4. Smoke barriers.
 - 5. Construction enclosing compartmentalized areas.
- B. Related Sections include the following:
 - 1. Division 7 Section "Building Insulation" for safing insulation and accessories.
 - 2. Division 9 Section "Gypsum Board Assemblies" for construction of openings in gypsum walls.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
 - 3. Fire-resistance-rated floor assemblies.
 - 4. Fire-resistance-rated roof assemblies.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814 or UL 1479, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

1. Penetrations into storage areas containing combustible materials.
- D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of through-penetration firestop system product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit engineering judgment drawing, developed by through-penetration firestop system manufacturer's fire-protection engineer in accordance with the provisions of the International Firestop Council.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
1. Classified System drawings from the Underwriters Laboratories Fire Resistance Directory, Volume 2.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who specializes in the installation of Firestop products. The installer's personnel shall be certified, licensed, or otherwise qualified by the firestopping manufacturer as having satisfactorily completed the necessary training to select and install products in accordance with the manufacturer's requirements. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in "Fire Resistance Directory."
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
- E. Installer Training: Individuals performing the installation of Firestop systems shall be trained by a direct representative of the Firestop materials manufacturer, not by a distributor or agent.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate size and location of cats-in-place Firestop devices to accommodate planned pipe and cable runs. Ensure proper placement of devices before placement of concrete.
- B. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- C. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- D. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- E. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated in the "Through-Penetration Firestop System Schedule" that are produced by one of the following manufacturers:
 - 1. Hilti Construction Chemicals, Inc.
 - 2. RectorSeal Corporation (The).
 - 3. 3M Fire Protection Products.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

- K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.
- L. Intumescent Acrylic Sealant: Firestop sealant that expands when exposed to heat. Protects penetrations containing combustible and non-combustible penetrants.
- M. Foam Blocks: Re-penetratable, "sponge-like" intumescent blocks that may be friction fit, deformed, or cut to fit in through-penetration openings.

2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Firestop system manufacturer's installation instructions shall be followed. In situations where the requirements of this Section differ from those of the manufacturer, the more conservative requirements shall govern.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.
1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.
 2. Inspection agency shall verify that installed systems are in accordance with either a UL-classified system or an engineering judgment drawing as described in Paragraph 1.4.B.2 of this Section.
- B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

- C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 - 1. Designation/indication that the penetration is fire-rated.
 - 2. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 3. Date of installation.
 - 4. Through-penetration firestop system manufacturer's name.
 - 5. Installing contractor's name, address, and telephone number.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

3.7 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Pipes (plastic or metal), conduit in vertical runs, installed through cast-in-place Firestop devices:
 - 1. UL-Classified Systems: Design Basis: FA 1016, FA 1017, FA 2053, FA 2054.
- C. Firestop Systems with No Penetrating Items FS-1: Comply with the following:
 - 1. UL-Classified Systems: Design Basis: CAJ0055, CAJ0070.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Acrylic sealant.
 - d. Intumescent putty.
 - e. Mortar.
 - f. Preformed intumescent blocks.

- D. Firestop Systems for Metallic Pipes, Conduit, or Tubing, FS-2: Comply with the following:
1. UL-Classified Systems: Design Basis: CAJ1184, CAJ1226, CAJ1277, CAJ1291, FC1009, WL1054.
 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Acrylic sealant.
 - d. Intumescent putty.
 - e. Mortar.
- E. Firestop Systems for Non-Metallic Pipes, Conduit, or Tubing, FS-3: Comply with the following:
1. UL-Classified Systems: Design Basis: CAJ2109, FA2053, FA2054, WL2078, WL2128.
 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant
 - b. Intumescent putty
 - c. Intumescent wrap strips.
 - d. Firestop device.
- F. Firestop Systems for Electrical Cables, FS-4: Comply with the following:
1. UL-Classified Systems: Design Basis: CAJ3095, FC3012, WL3065, WL3112..
 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant.
 - b. Intumescent putty.
 - c. Silicone foam.
- G. Firestop Systems for Cables Trays, FS-5: Comply with the following:
1. UL-Classified Systems: Design Basis: CAJ4035, WL4011.
 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant.
 - b. Intumescent putty.
 - c. Silicone foam.
 - d. Pillows/bags.
 - e. Foam blocks.
 - f. Firestop mortar.
- H. Firestop Systems for Insulated Pipes, FS-6: Comply with the following:
1. UL-Classified Systems: Design Basis: CAJ5091, WL5029.
 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant.
 - b. Silicone foam.

- c. Intumescent wrap strips.
 - d. Pre-formed intumescent blocks.

- I. Firestop Systems for Miscellaneous Electrical Penetrants, FS-7: Comply with the following:
 - 1. UL-Classified Systems: Design Basis: CAJ6006, CAJ6017.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant.
 - b. Intumescent putty.
 - c. Mortar.

- J. Firestop Systems for Miscellaneous Mechanical Penetrations, FS-8: Comply with the following:
 - 1. UL-Classified Systems: Design Basis: CAJ7021, CAJ7040, CAJ7046, CAJ7051.
 - 2. Type of Fill Materials: One or both of the following:
 - a. Intumescent sealant.
 - b. Mortar.
 - c. Acrylic sealant.
 - d. Silicone sealant.

- K. Firestop Systems for Groupings of Penetrations, FS-9: Comply with the following:
 - 1. UL-Classified Systems: Design Basis: CAJ8056, WJ8007, WL8014.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Acrylic sealant.
 - c. Mortar.
 - d. Intumescent wrap strips.
 - e. Firestop device.
 - f. Intumescent composite sheet.
 - g. Pre-formed intumescent blocks.

|
END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in the following vertical surfaces and horizontal non-traffic surfaces:
 - a. Perimeter joints windows and adjacent materials.
 - 2. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:
 - a. Perimeter joints between interior wall surfaces, sills and frames of windows.
- B. Related Sections include the following:
 - 1. Division 7 Section "Vinyl Siding"
 - 2. Division 8 Section "Vinyl Windows"

1.3 PERFORMANCE REQUIREMENTS

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

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in **1/2-inch- (13-mm-)** wide joints formed between two **6-inch- (150-mm-)** long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- F. Qualification Data: For Installer.
- G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- H. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- I. Field Test Report Log: For each elastomeric sealant application.
- J. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- K. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below **40 deg F (5 deg C)**.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: 20 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 - 1. Basis of Design: Pecora Corporation – Silicone Sealant #890
 - 2. Subject to compliance with the requirements, provide the specified product or a comparable product by the following:
 - a. Pecora Corporation
 - b. Dow Corning Corporation
 - c. Tremco Incorporated
 - d. Sika Corporation

2.4 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to **minus 26 deg F (minus 32 deg C)**. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable

of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

a. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Vinyl

- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab; Method B, Exposed Surface Finish Hand Pull Tab; or Method C, Field-Applied Sealant Joint Hand Pull Flap, in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 2. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free of voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 081113 – HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Steel doors.
2. Steel door frames.
3. Sidelight frames
4. Borrowed-light frames.
5. Fire-rated door and frame assemblies.

- B. Related Sections include the following:

1. Division 8 Section "Flush Wood Doors" for wood doors installed in steel frames.
2. Division 8 Section "Door Hardware" for door hardware and weather stripping.
3. Division 8 Section "Glazing" for glass in glazed openings in doors and frames.
4. Division 9 Section "Gypsum Board Assemblies" for spot-grouting frames installed in steel-framed gypsum board partitions.
5. Division 9 Section "Painting" for field painting factory-primed doors and frames.

1.3 DEFINITIONS

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.4 SUBMITTALS

- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.

- B. Shop Drawings: Show the following:

1. Elevations of each door design.
2. Details of doors including vertical and horizontal edge details.
3. Frame details for each frame type including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Coordination of glazing frames and stops with glass and glazing requirements.

- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for factory-finished doors and frames.
- D. Samples for Verification: For each type of exposed finish required, prepare a sample not less than **3 by 5 inches (75 by 125 mm)** and of same thickness and material indicated for final unit of Work.
- E. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
- F. Oversize Construction Certificates: For door assemblies required to be fire-protection rated and exceeding size limitations of labeled assemblies.

1.5 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
 - 1. Test Pressure: Test at atmospheric pressure.
 - 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 3. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of **450 deg F (250 deg C)** maximum in 30 minutes of fire exposure.
- C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Store doors and frames at building site under cover. Place units on minimum **4-inch- (100-mm-)** high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum **1/4-inch (6-mm)** spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Doors and Frames:
 - a. Amweld Building Products, Inc.
 - b. Ceco Door Products; an Assa Abloy Group Company.
 - c. Curries Company; an Assa Abloy Group Company.
 - d. Copco Door Co.
 - e. Kewanee Corporation (The).
 - f. Pioneer Industries Inc.
 - g. Republic Builders Products.
 - h. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- B. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF180) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.
- C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

2.3 DOORS

- A. General: Provide doors of sizes, thicknesses, and designs indicated.
- B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 3 (Stile and Rail).
- C. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 3 (Stile and Rail).
- D. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2.4 FRAMES

- A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Frames of **0.067-inch- (1.7-mm-)** thick steel sheet for:
 - 1. Level 3 steel doors, unless otherwise indicated.
 - 2. Wood doors, unless otherwise indicated.
- C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
- D. Plaster Guards: Provide **0.016-inch- (0.4-mm-)** thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
- E. Supports and Anchors: Fabricated from not less than **0.042-inch- (1.0-mm-)** thick, electrolytic zinc-coated or metallic-coated steel sheet.
 - 1. Wall Anchors in Masonry Construction: **0.177-inch- (4.5-mm-)** diameter, steel wire complying with **ASTM A 510 (ASTM A 510M)** may be used in place of steel sheet.
- F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.5 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of **0.053-inch- (1.3-mm-)** thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
- C. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:
 - 1. Cold-rolled steel sheet, unless otherwise indicated.
 - 2. Metallic-coated steel sheet where indicated.
- D. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
 - 1. Resin-impregnated kraft/paper honeycomb.
 - 2. Polyurethane.
 - 3. Polystyrene.

4. Vertical steel stiffeners.
 5. Rigid mineral-fiber board.
- E. Clearances for Non-Fire-Rated Doors: Not more than **1/8 inch (3.2 mm)** at jambs and heads, except not more than **1/4 inch (6.4 mm)** between pairs of doors. Not more than **3/4 inch (19 mm)** at bottom.
- F. Clearances for Fire-Rated Doors: As required by NFPA 80.
- G. Single-Acting, Door-Edge Profile: Beveled edge, unless square edge is indicated.
- H. Double-Acting, Door-Edge Profile: Round vertical edges with **2-1/8-inch (54-mm)** radius.
- I. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- J. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- K. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- L. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
1. Unless otherwise indicated, provide thermal-rated assemblies with U-value of **0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K)** or better.
- M. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 1408, and classified according to ASTM E 413.
1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or better.
- N. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.
- O. Frame Construction: Fabricate frames to shape shown.
1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
 2. Provide welded frames with temporary spreader bars.

- P. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- Q. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- R. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.
 - 1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 - 2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
- S. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.6 FINISHES

- A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
 - 2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
 - 3. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
 - 4. Install fire-rated frames according to NFPA 80.
 - 5. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.
- C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
 - 1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
 - 2. Smoke-Control Doors: Install to comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Solid-core doors with wood-veneer, faces.
2. Factory finishing flush wood doors.
3. Factory machining for hardware.
4. Louvers for flush wood doors.
5. Acoustically rated doors.
6. Fire rated doors.

- B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 1. Indicate dimensions and locations of mortises and holes for hardware.
 2. Indicate dimensions and locations of cutouts.
 3. Indicate requirements for veneer matching.
 4. Indicate doors to be factory finished and finish requirements.
 5. Indicate fire ratings for fire doors.
- C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.
- D. Samples for Verification:
 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish,

provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
3. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
4. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 1. Test Pressure: Test at atmospheric pressure.
 2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.
 3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than **1/4 inch (6.4 mm)** in a **42-by-84-inch (1067-by-2134-mm)** section, or show telegraphing of core construction in face veneers exceeding **0.01 inch in a 3-inch (0.25 mm in a 75-mm)** span.
1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Chappell Door Co.
 - c. Eagle Plywood & Door Manufacturing, Inc.
 - d. Eggers Industries; Architectural Door Division.
 - e. Graham Wood Doors, An Assa Abloy Group Company
 - f. Weyerhaeuser Company.
 2. Metal Louvers for Doors:
 - a. Air Louvers, Inc.
 - b. Hiawatha, Inc.
 - c. Leslie-Locke, Inc.
 - d. Pemko, An Assa Abloy Group Company

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
1. Grade: Custom, with Grade A faces.
 2. Species and Cut: Maple, plain sliced.
 3. Match between Veneer Leaves: Book match.
 4. Assembly of Veneer Leaves on Door Faces: Running match.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Transom Match: Continuous match.
7. Stiles: Same species as faces or a compatible species.
8. Thickness: 1-3/4"
9. Face Veneer thickness: 1/32" minimum.

2.3 SOLID-CORE DOORS

A. Interior Veneer-Faced Doors:

1. Core: Engineered composite wood that does not contain urea formaldehyde.
2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

B. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as follows:
 - a. 5-inch (125-mm) top-rail blocking.
 - b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
 - d. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

C. Acoustical Doors: Doors shall comply with all applicable requirements for solid core flush interior doors and in addition shall comply with requirements as hereinafter specified.

1. Thickness: 1-3/4.
2. STC: As indicated on drawings, tested in accordance with ASTM E-903. Submit test report certificate to the Authority.
3. Finish of door: as indicated on the Drawings.
4. Contractor shall submit test report to the Architect certifying that the sound proof door proposed to be installed will provide rating range as noted above.
5. Stop Beads

- a. Adjustable type, matching hardwood (same specie as finish veneer) face with soft neoprene gasket.
 - b. Secure beads to metal jambs with metal cup bead adjusters and self tapping sheet metal screws spaced at a maximum of 8" o.c.
6. Threshold Seal: Plunger operated, self retracting neoprene gasket sweep. Mechanism may be let into face with a metal cover plate, or be completely housed in bottom of door.
 7. Provide cutout for glazing to receive double glazed combination of 1/4" polished wire glass as specified under Section 08800.
 8. Hardware: Stop bead adjusters and threshold seal, to be furnished under this section; finish shall match door hardware specified.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors:

1. Wood Species: Same species as door faces.
2. Profile: Manufacturer's standard shape.
3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

B. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.

C. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI System TR-6 catalyzed polyurethane.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Effect: Filled finish.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 53 13 - VINYL WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes operable vinyl-framed windows.

1.3 DEFINITIONS

- A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:
 - 1. R: Residential.
- B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:
 - 1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.
- C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
- D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide vinyl windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of test size indicated below:
 - 1. Size required by AAMA/WDMA 101/I.S.2/NAFS for gateway performance for both gateway performance and optional performance grade.
- B. Structural Performance: Provide vinyl windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - a. Basic Wind Speed: 110 mph.

C. Design Pressure: DP35 minimum.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of vinyl window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
 1. Mullion details, including reinforcement and stiffeners.
 2. Joinery details.
 3. Expansion provisions.
 4. Flashing and drainage details.
 5. Weather-stripping details.
 6. Glazing details.
 7. Window cleaning provisions.
 8. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of vinyl windows, and used to determine structural test pressures and design pressures from basic wind speeds indicated.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
 1. Include similar Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For vinyl windows and components required, prepared on Samples of size indicated below.
 1. Main Framing Member: 12-inch-long, full-size sections of window frame with factory-applied color finish.
 2. Window Corner Fabrication: 12-by-12-inch-long, full-size window corner including full-size sections of window frame with factory-applied color finish, weather stripping, and glazing.
 3. Operable Window: Full-size unit with factory-applied finish.
 4. Hardware: Full-size units with factory-applied finish.
 5. Weather Stripping: 12-inch-long sections.
- E. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

- F. Qualification Data: For Installer and manufacturer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of vinyl window. Test results based on use of downsized test units will not be accepted.
- H. Maintenance Data: For operable window sash, operating hardware, weather stripping and finishes to be included in maintenance manuals.
- I. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to vinyl window manufacturer for installation of units required for this Project.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating vinyl windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- C. Source Limitations: Obtain vinyl windows through one source from a single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for vinyl windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of vinyl windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements." Do not modify size and dimensional requirements.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- F. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Provide AAMA / WDMA-certified vinyl windows with an attached label.
- G. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to vinyl windows including, but not limited to, the following:
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review, discuss, and coordinate the interrelationship of vinyl windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify vinyl window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating vinyl windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of vinyl, other materials, and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing: 10 years from date of Substantial Completion.
 - c. Vinyl Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Certainteed - (Bryn Mawr 3) 1680 Series Vinyl Double Slider Window and 1695 Series Vinyl Basement Hopper Window or comparable products by one of the following:
1. Certainteed Corporation
 2. Simonton Building Products, Inc.
 3. Silverline Building Products, LLC

2.2 MATERIALS

- A. Vinyl Extrusions: Rigid (unplasticized) hollow PVC extrusions, formulated and extruded for exterior applications, complying with AAMA/WDMA 101/I.S.2/NAFS and the following:
1. PVC Resins: 100 percent virgin resin.
 2. PVC Formulation: High impact, low heat buildup, lead free, nonchalking, and color and UV stabilized.
 3. Main Frame Extrusion Wall Thickness: Not less than 0.062 inch.
 4. Sash Extrusion Wall Thickness: Not less than 0.062 inch.
- B. Vinyl Trim and Glazing Stops: Material and finish to match frame members.
- C. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with vinyl window members, cladding, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Reinforcing Members: Aluminum, or nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

- F. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and for complete concealment when vinyl window is closed.
 - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.
- G. Replaceable Weather Seals: Comply with AAMA 701/702.

2.3 WINDOW

- A. Window Types: Double Sliders and Hoppers
- B. AAMA/WDMA Performance Requirements: Provide vinyl windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS unless more stringent performance requirements are indicated.
 - 1. Performance Class: R.
- C. Condensation-Resistance Factor (CRF): Provide vinyl windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.
- D. Thermal Transmittance: Provide vinyl windows with a whole-window, U-factor maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.
 - 1. U-Factor: 0.30 Btu/sq. ft. x h x deg F or less.
- E. Solar Heat-Gain Coefficient (SHGC): Provide vinyl windows with a whole-window SHGC maximum of 0.30, determined according to NFRC 200 procedures.
- F. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA 101/I.S.2/NAFS for operating window types indicated.

2.4 GLAZING

- A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements applicable to glazed vinyl window units.
- B. Glass: Clear, insulating-glass units, argon gas filled, with low-E coating pyrolytic on second surface or sputtered on second or third surface.
- C. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.5 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with vinyl; designed to smoothly operate, tightly close, and securely lock vinyl windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide extruded or cast aluminum.
- B. Sill Cap/Track: Rigid PVC or other weather-resistant plastic track with manufacturer's standard integral color, of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
- C. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- D. Limit Devices: Provide secondary night latches to limit openings to 6 inches for ventilation.

2.6 INSECT SCREENS

- A. General: Design windows and hardware to accommodate half screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on outside of window and provide for each operable exterior sash or ventilator.
 - 1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Residential R-20 class.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners and removable PVC spline/anchor concealing edge of frame.
 - 1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
 - 2. Finish: Manufacturer's standard.
 - 3. Frame Color: White
- C. Aluminum Wire Fabric: 18-by-16 mesh of coated aluminum wire.
 - 1. Wire-Fabric Finish: Charcoal gray.

2.7 FABRICATION

- A. Fabricate vinyl windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
 - 1. Welded Frame and Sash/Ventilator Corners: Miter-cut and fusion or chemically welded.

- B. Fabricate vinyl windows that are reglazable without dismantling sash or ventilator framing.
- C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator, unless otherwise indicated.
- D. Mullions: Provide mullions and cover plates as shown, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units. Provide manufacturer's standard finish to match window units.
- E. Subframes: Provide head expander as indicated on drawings. Provide manufacturer's standard finish to match window units. Provide subframes capable of withstanding design loads of window units.
- F. Factory-Glazed Fabrication: Glaze vinyl windows in the factory. Comply with requirements in AAMA/WDMA 101/I.S.2/NAFS.
- G. Glazing Stops: Provide glazing stops to match sash and ventilator frames.
- H. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant steel reinforcement complying with requirements for reinforcing members, or do both.
- I. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

2.8 VINYL FINISHES

- A. Integral Finish and Color: Uniform, solid, homogeneous white interior and exterior.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.

2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 08 53 13

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
- 2. Cylinders for doors specified in other Sections.
- 3. Electrified door hardware.

- B. Related Sections include the following:

- 1. Division 8 Section "Steel Door Frames" for door silencers provided as part of hollow-metal frames.
- 2. Division 8 Section "Flush Wood Doors".
- 3. Division 16 Sections for connections to electrical power system and for low-voltage wiring work.

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Certificates: For electrified door hardware, signed by product manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks, latches and closers.
- D. Other Action Submittals:
 - 1. Door Hardware Sets: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

- a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
- b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, and material of each door and frame.
 - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - 3) Complete designations of every item required for each door or opening including name and manufacturer.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) Door and frame sizes and materials.
 - 9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 - 10) List of related door devices specified in other Sections for each door and frame.
- c. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 2. Installer shall have warehousing facilities in Project's vicinity.
 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.6 COORDINATION

- A. Coordinate layout and installation of recessed drop bolts with floor construction (accordian sliding grille doors). Cast anchoring inserts into concrete.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies and fire alarm system and detection devices.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: See Drawings for door hardware schedule.

2.2 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum

fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.3 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets with finishes below only:
 1. BHMA 626: Satin Chromium plated over nickel, over brass or bronze base metal.
 2. U.S. Standard 26D: Satin Chromium Finish.
 3. BHMA 652: Satin Chromium plated steel
 4. U.S. Standard 32D: Satin Stainless Steel
 5. BHMA 630: Satin Stainless Steel
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated on Drawings or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, in equipment room. Verify location with Architect.
 - 1. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.
- D. Thresholds: Set thresholds for exterior doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.

2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point **3 inches (75 mm)** from the latch, measured to the leading edge of the door.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

- A. The extent of gypsum drywall construction is indicated on the drawings and also includes miscellaneous wall patching, ceiling patching and as required to finish areas disturbed by demolition.
- B. This section includes the following types of gypsum board construction:

Gypsum board of thickness and type indicated on drawings for screw attached to wood framing.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

- A. All gypsum drywall assemblies where fire ratings are indicated or required shall have fire resistive classifications acceptable to the State and Local Building Officials and Fire Marshalls.

1.3 SUBMITTALS

- A. Refer to Section 01 30 00
- B. Submit for review samples of and data on all gypsum drywall materials proposed for use.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements provide products of one of the following: references made to specific products are given only to establish standards of quality and design:
 - 1. Gypsum Board and Related Products:
Centex American Gypsum Co.
Georgia Pacific Corp.
Gold Bond Building Products Div., National Gypsum Co.
United States Gypsum Co.

MATERIALS

- A. Gypsum Board: USG sheetrock brand gypsum panels or similar tapered edge gypsum wall board, sheet sizes as required to minimize the number of joints. Provide thicknesses as indicated on drawings. Provide moisture / mold resistant gypsum board where shown on drawings.
- B. Screw fasteners for gypsum board: USG or similar drywall screws, type and length as required for the particular installation.
- C. Corner bead: USG No. 103 Dur-A0Bead or similar galvanized steel corner reinforcement with 1 ¼” wings.
- D. Casing Bead: USG No. 200A U-shaped channel; ½” or 5/8” as required.
- E. Joint Treatment: USG Perf-a-Tape joint tape, USG Ready Mixed Plus 3 joint compound.

PART 3 – EXECUTION**3.1 EXAMINATION**

- A. Examine substrates to which drywall construction attaches or abuts. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF MATERIALS

- A. Examine all work specified in this Section in accordance with Gypsum Association Specification GA-216-85, ANSI A97.2-1971, and the recommendations of the material manufacturers.
- B. Unless otherwise indicated, install all gypsum board on walls to underside of construction above.
- C. Carefully coordinate all work specified in this section with all other work affected thereby. Make provisions for all items required to be recessed into or attached to work specified in this Section.
- D. Isolate finish gypsum board surfaces in accordance with recommendations of gypsum board manufacturer using control or other approved means.

END OF SECTION 09 29 00

SECTION 095110 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes acoustical panels and exposed suspension systems for ceilings.

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- B. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product to be approved by the Architect:
 - 1. Product: As indicated on drawings.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than ~~0.106-inch-~~ (2.69-mm-) diameter wire.
- E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILINGS

- A. Basis-of-Design Product (Interior): Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product to be approved by the Architect:
 - 1. Armstrong World Industries
 - a. Product: As indicated on drawings.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings:
 - 1. Armstrong World Industries
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
 - 1. Paired USG Compasso System: 6-inch wide face, 9/16-inch horizontal legs with hems formed for attachment to the mounting bracket creating a 5/8-inch reveal; commercial quality.

- a. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with **ASTM B 221 (ASTM B 221M)** for Alloy and Temper 6063-T5.
- b. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- c. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; organic coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
- d. Organic Coating: Thermosetting, primer/topcoat system with a minimum dry film thickness of **0.8 to 1.2 mils (0.02 to 0.03 mm)**.

2.6 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, provide one of the following:
 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. USG Corporation; SHEETROCK Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 6. Do not attach hangers to steel deck tabs.
 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 8. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than **16 inches (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends, leveling with ceiling suspension system to a tolerance of **1/8 inch in 12 feet (3.2 mm in 3.6 m)**. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. Install panels with pattern running in one direction parallel to short axis of space.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095110

SECTION 09 65 19 - RESILIENT FLOOR TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Vinyl composition tile (VCT).
 - 2. Resilient wall base and accessories.
 - 3. Self-Leveling Underlayment.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
 - 1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long, of each resilient product color and pattern required.
- D. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Floor Tile: Furnish 1 box for every 100 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 2. Resilient Wall Base and Accessories: Furnish not less than 5 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following: For purposes of establishing standards of quality and design; specifications reference products of Armstrong World Industries, Inc.:
1. Manufacturers of Vinyl Composition Tile for all VCT types:
 - a. Armstrong World Industries, Inc. – Standard Excelon, Imperial Texture Classics

2.2 TILE FLOORING

- A. Vinyl composition tile FS SS-T-312B(1), Type IV, 12" x 12" unless otherwise indicated and as follows:
1. Composition 1 - Asbestos free.
 2. Gauge: 1/8"
 3. Color and Pattern detail shall be dispersed uniformly throughout thickness of material. Color and pigments to be insoluble in water and resistant to cleaning agents and light.

2.3 ACCESSORIES

- A. Vinyl Wall Base: Provide vinyl wall base complying with ASTM F 1861, Type TV, with matching end stops and preformed or molded corner units, and as follows:
 - 1. Height: 4".
 - 2. Thickness: 1/8"
 - 3. Style: Standard top-set, cove base.
 - 4. Finish: Matte.
- B. Resilient Edge Strips: 1/8" thick, homogeneous vinyl composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from full range of colors available; not less than 1" wide.
- C. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.
- D. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- E. Leveling and Patching Compounds: Latex type as recommended by flooring manufacturer.
- F. Self-leveling underlayment for wood sub-floors: Ardex or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - a. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- F. Provide ¼" thick minimum self-leveling underlayment for all wood sub-floors.
- G. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- H. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles in pattern indicated or square with room axis if no pattern is indicated on Drawings.
- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles in a pattern and direction to match existing pattern and direction.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.

- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
 2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
 3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09 65 19

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items may include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Acoustical wall panels.
 - c. Toilet enclosures.
 - d. Metal lockers.
 - e. Elevator entrance doors and frames.
 - f. Elevator equipment.
 - g. Finished mechanical and electrical equipment.
 - h. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - g. Elevator shafts.

3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
1. Division 5 Section "Structural Steel" for shop priming structural steel.
 2. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
 3. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
 4. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.
 5. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

- B. Samples for Initial Selection: For each type of finish-coat material indicated.
1. After color selection, Architect will furnish color chips for surfaces to be coated.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
 3. Submit three (3) Samples on the following substrates for Architect's review of color and texture only:
 - a. Concrete Unit Masonry: **6-by-10-inch (150-by-250-mm)** Samples of masonry, with mortar joint in the center, for each finish and color.
 - b. Painted Wood: **12-inch- (300-mm-)** square Samples for each color and material on hardboard.
 - c. Stained or Natural Wood: **6-by-10-inch (150-by-250-mm)** Samples of natural- or stained-wood finish on representative surfaces.
 - d. Ferrous Metal: **8-inch- (100-mm-)** square Samples of flat metal and **8-inch- (200-mm-)** long Samples of solid metal for each color and finish.
- D. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Wall Surfaces: Provide samples on at least **100 sq. ft. (9 sq. m)**.
 - b. Small Areas and Items: Architect will designate items or areas required.
 2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.

3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of **45 deg F (7 deg C)**. Maintain storage containers in a clean condition, free of foreign materials and residue.
 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between **50 and 90 deg F (10 and 32 deg C)**.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between **45 and 95 deg F (7 and 35 deg C)**.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
 1. Quantity: Furnish Owner with an additional 5 percent, but not less than **1 gal. (3.8 L)** or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design based on the products named in other Part 2 articles and in the schedule at the end of Part 3. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:
1. Benjamin Moore & Co. (Benjamin Moore).
 2. PPG Industries, Inc. (Pittsburgh Paints).
 3. Pratt & Lambert, Inc. (Pratt & Lambert)
 4. Sherwin-Williams Co. (Sherwin-Williams).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: As selected by Architect from manufacturer's full range.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

- A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.
1. Benjamin Moore; Moorcraft Super Craft Latex Block Filler No. 285: Applied at a dry film thickness of not less than **8.1 mils (0.206 mm)**.
 2. Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than **6.0 to 12.5 mils (0.152 to 0.318 mm)**.
 3. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than **8.0 mils (0.203 mm)**.

2.4 EXTERIOR PRIMERS

- A. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than **2.0 mils (0.051 mm)**.
 2. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than **3.0 mils (0.076 mm)**.
 3. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than **3.0 mils (0.076 mm)**.

2.5 INTERIOR PRIMERS

- A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than **1.2 mils (0.030 mm)**.
 2. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than **1.0 mil (0.025 mm)**.
 3. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than **3.0 mils (0.076 mm)**.
- B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than **1.2 mils (0.030 mm)**.
 2. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than **1.0 mil (0.025 mm)**.
 3. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than **1.6 mils (0.041 mm)**.
- C. Interior Wood Primer for Acrylic-Enamel and Semigloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than **1.5 mils (0.038 mm)**.
 2. Pittsburgh Paints; 6-855 SpeedHide Latex Enamel Undercoater: Applied at a dry film thickness of not less than **1.0 mil (0.025 mm)**.
 3. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than **1.6 mils (0.041 mm)**.
- D. Interior Wood Primer for Full-Gloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than **1.5 mils (0.038 mm)**.
 2. Pittsburgh Paints; 6-6 SpeedHide Interior Quick-Drying Enamel Undercoater: Applied at a dry film thickness of not less than **1.4 mils (0.036 mm)**.
 3. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than **1.6 mils (0.041 mm)**.
- E. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than **2.0 mils (0.051 mm)**.
 2. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than **1.5 mils (0.038 mm)**.
 3. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than **3.0 mils (0.076 mm)**.
- F. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than **2.0 mils (0.051 mm)**.
2. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than **3.0 mils (0.076 mm)**.
3. Sherwin-Williams; Galvite HS B50WZ30: Applied at a dry film thickness of not less than **3.0 mils (0.076 mm)**.

2.6 EXTERIOR FINISH COATS

- A. Exterior Full-Gloss Alkyd Enamel: Factory-formulated full-gloss alkyd enamel for exterior application.
1. Benjamin Moore; Moore's IMC Urethane Alkyd Enamel M22: Applied at a dry film thickness of not less than **2.0 mils (0.051 mm)**.
 2. Pittsburgh Paints; 7-814 Pittsburgh Paints Industrial Gloss-Oil Interior/Exterior Enamel: Applied at a dry film thickness of not less than **1.5 mils (0.038 mm)**.
 3. Sherwin-Williams; Industrial Enamel B-54 Series: Applied at a dry film thickness of not less than **2.0 mils (0.051 mm)**.

2.7 INTERIOR FINISH COATS

- A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.
1. Benjamin Moore; Moorecraft Super Spec Latex Flat No. 275: Applied at a dry film thickness of not less than **1.2 mils (0.031 mm)**.
 2. Pittsburgh Paints; 6-70 Line SpeedHide Interior Wall Flat-Latex Paint: Applied at a dry film thickness of not less than **1.0 mil (0.025 mm)**.
 3. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30W200 Series: Applied at a dry film thickness of not less than **1.4 mils (0.036 mm)**.
- B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
1. Benjamin Moore; Moorcraft Super Spec Latex Eggshell Enamel No. C-274: Applied at a dry film thickness of not less than **1.3 mils (0.033 mm)**.
 2. Pittsburgh Paints; 6-400 Series SpeedHide Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than **1.25 mils (0.032 mm)**.
 3. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W200 Series: Applied at a dry film thickness of not less than **1.6 mils (0.041 mm)**.
- C. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276: Applied at a dry film thickness of not less than **1.2 mils (0.031 mm)**.
 2. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than **1.0 mil (0.025 mm)**.
 3. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31W200 Series: Applied at a dry film thickness of not less than **1.3 mils (0.033 mm)**.
- D. Interior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss acrylic-latex interior enamel.

1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel No. M28: Applied at a dry film thickness of not less than **2.0 mils (0.051 mm)**.
2. Pittsburgh Paints; 90-374 Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamel: Applied at a dry film thickness of not less than **3.0 mils (0.076 mm)**.
3. Sherwin-Williams; ProMar 200 Interior Latex Gloss Enamel B21W201: Applied at a dry film thickness of not less than **1.5 mils (0.038 mm)**.

2.8 INTERIOR WOOD STAINS AND VARNISHES

- A. Open-Grain Wood Filler: Factory-formulated paste wood filler applied at spreading rate recommended by manufacturer.
 1. Benjamin Moore; Benwood Paste Wood Filler No. 238.
 2. Sherwin-Williams; Sher-Wood Fast-Dry Filler.
- B. Interior Wood Stain: Factory-formulated alkyd-based penetrating wood stain for interior application applied at spreading rate recommended by manufacturer.
 1. Benjamin Moore; Benwood Penetrating Stain No. 234.
 2. Pittsburgh Paints; 77-560 Rez Interior Semi-Transparent Oil Stain.
 3. Sherwin-Williams; Wood Classics Interior Oil Stain A-48 Series.
- C. Clear Sanding Sealer: Factory-formulated fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer.
 1. Benjamin Moore; Moore's Interior Wood Finishes Quick-Dry Sanding Sealer No. 413.
 2. Pittsburgh Paints; 6-10 SpeedHide Quick-Drying Interior Sanding Wood Sealer and Finish.
 3. Sherwin-Williams; Wood Classics Fast Dry Sanding Sealer B26V43.
- D. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
 1. Benjamin Moore; Stays Clear Acrylic Polyurethane No. 423, Satin.
 2. Pittsburgh Paints; 77-49 Rez Satin Acrylic Clear Polyurethane.
 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane Satin, A68 Series.
- E. Interior Waterborne Clear Gloss Varnish: Factory-formulated clear gloss acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
 1. Benjamin Moore; Benwood Interior Wood Finishes Polyurethane Finishes High Gloss No. 428.
 2. Pittsburgh Paints; 77-45 Rez Full-Gloss Acrylic Clear Polyurethane.
 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane Gloss, A68 Series.
- F. Paste Wax: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
 - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to [SSPC-SP 6/NACE No. 3] [SSPC-SP 10/NACE No. 2].
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
 - 1. Uninsulated metal piping.
 - 2. Uninsulated plastic piping.
 - 3. Pipe hangers and supports.
 - 4. Tanks that do not have factory-applied final finishes.
 - 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 - 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
 - 1. Switchgear.
 - 2. Panelboards.
 - 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats, unless otherwise indicated or specified.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
 - a. Film thickness
 - b. Paint composition
 - c. Gloss
3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 SCHEDULE OF PAINT MATERIALS

- A. All products are those of Benjamin Moore & Co.
- B. Surface Prep
 1. SP-1: Clean all surfaces to be coated, with Benjamin Moore M83 Oil and Grease Emulsifier, or suitable cleaning solution.
 2. SP-2: Spot prime bare substrate.

3.8 SCHEDULE OF PAINT MATERIALS

Number Key

Material

Interior Primers

- 1 216-00 Regal First Coat
- 2 217-00 Alkyd Enamel Underbody

Interior Finish coats

- 3 215 Regal Flat Finish Wall Satin
- 4 319 Regal Eggshell Finish Aqua Velvet
- 5 310 Regal Pearl Finish Aqua Velvet
- 6 333 Regal Semi-gloss finish Aqua Glo
- 7 235 Satin Impervo

Stains & Clear Finishes

- 8 413 Quick Dry Sanding Sealer
- 9 234 Benwood Penetrating Stain
- 10 404-00 Benwood Satin finish Varnish
- 11 422 Stays Clear Low Lustre Acrylic Polyurethane
- 12 423 Stays Clear High Gloss Acrylic Polyurethane

Exterior Primers

- 13 102-00 Moores Latex Exterior Primer
- 14 100-00 Moorwhite Alkyd Primer

Exterior Finish Coats

- 15 105 Moorlife Flat
- 16 103 Moorgard Low Lustre
- 17 096 Moor Glo soft Gloss
- 18 110 Moores House Paint Alkyd Gloss

Metal Primers

- 19 M06 Alkyd Metal Primer
- 20 M04 Acrylic Metal Primer
- 21 M32 Polyamide Epoxy Metal Primer

Specialty coatings

- 22 M22 Urethane Alkyd Enamel
- 23 M43/M44 Acrylic Epoxy
- 24 M88 Latex Block Filler
- 25 M53 Sweep-up Spray Latex Flat
- 26 M51 Sweep-up Alkyd Flat
- 27 Universal Wall Primer/Sizer
- 28 M24 Direct to Metal Alkyd semi-Gloss
- 29 M31/M32 Waterborne Epoxy Block Filler
- 30 M42 Waterborne Polyamide Epoxy
- 31 M29 Direct to Metal Acrylic semi-Gloss

Note: Deep accent colors shall be top coated with Stays Clear acrylic Polyurethane.

3.9 SCHEDULING OF PAINTING

A. Exterior Surfaces

		Coats			
		1 st	2 nd	3 rd	4 th

1.	*Galvanized metal	20	31	31
2.	*Ferrous Metal	19	28	28
3.	Sheetrock	13	16	

*Includes new miscellaneous steel, ferrous metal, exposed angles and lintels, miscellaneous metal, vent pipes above roofs, support for equipment on roof, hollow metal doors and frames, other metal doors, fans, air handling units, miscellaneous equipment on roofs, pipes, ducts and conduits.

B.	Interior Surfaces	Coats			
		1 st	2 nd	3 rd	4 th
1.	Ferrous metal (includes stairs, railings, exposed pipes, etc.)	19	28	28	
2.	Masonry: (epoxy)	24	23	23	
	(paint)	24	4		
3.	Gyp. Board/ (eggshell fin)	1	4		
	Gyp. Board/ (semi-gloss fin)	1	5		
	Gyp. Board/ (epoxy)	1	23	23	
4.	Stained wood/millwork	9	*8	*11	*11
5.	Wood Painted	2	7	7	
6.	Exposed steel, decking, ducts, piping, conduits, misc. hangers, etc.	25			

*Sand lightly between coats.

3.10 ACCENT COLORS

- A. One (1) wall, in each space where painting is called for, shall have one (1) accent color.

END OF SECTION 099100

SECTION 102800 – TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Toilet and bath accessories.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Samples: For each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- E. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
- B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
 - 1. Other manufacturers' products with equal characteristics may be considered. See Division 1 Section "Substitutions."
 - 2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

- C. Structural Strengths: Allowable stresses shall not be exceeded for materials when a vertical or horizontal force of 250 lbs. is applied at any point on grab bars, shower seats, and associated fasteners, mounting devices, or supportive structures.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
 - 1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
 - 1. Toilet and Bath Accessories:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 - d. McKinney/Parker Washroom Accessories Corp.
 - 2. Underlavatory Guards:
 - a. Brocar Products, Inc.
 - b. Truebro, Inc.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.
- B. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
- D. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
- E. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
- F. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- G. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

- A. General: One, maximum 1-1/2-inch- (38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least **250 lbf (1112 N)**, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

- A. Basis-of-Design Product: The design for each accessory is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.
- B. Toilet Tissue Holder: Surface mounted unit. Supplied by owner, installed by contractor.
- C. Paper Towel Dispenser: Surface mounted unit. Supplied by owner, installed by contractor.
- D. Mirror: Bobrick B290 stainless steel framed mirror with galvanized steel back, 1/4" select float glass mirror, 15 year guarantee, concealed locking screws. Sizes as indicated.
- E. Grab Bar: Bobrick No. B-6206.99 series, sizes and shapes as required per drawings. All grab bars to have concealed mounting.
- F. Grab Bar: Swing up, Bobrick Model B-4998.99.
- G. Soap Dispenser: Surface mounted unit. Supplied by owner, installed by contractor.

END OF SECTION

SECTION 15000 – GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work described in this division shall be governed by all the conditions of Division 1, "General Requirements", "General Conditions" and "Supplementary Conditions" as well as all plans, specifications and all addenda issued during the bidding period.
- B. The attention of each bidder is hereby directed to the "Instructions to Bidders", for he will be required to comply with all the terms and conditions set forth therein.
- C. The submission of a Mechanical Contract Proposal to the G.C. shall be deemed as evidence that this Contractor is aware of all the requirements and instructions contained in Division 1.
- D. Specifically included in this Division from Division 1, shall be:
 - 1. Invitation to Bidders
 - 2. Bid Proposal
 - 3. Instruction to Bidders
 - 4. Supplemental General Conditions

END OF SECTION 15000

SECTION 15010 – GENERAL PROVISIONS FOR MECHANICAL WORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls are specified in Section 01500. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards are specified in Section 01600.
- D. General requirements for Mechanical work are specified in Section 15010.
- E. The attention of each bidder is hereby directed to the "Instructions to Bidders" for he will be required to comply with all terms and conditions set forth therein.
- F. If any of the work under this Division is performed by a subcontractor, the contractor shall, nevertheless, remain responsible for the proper integration of the work under this Division with the work under all other Divisions of these specifications.
- G. The word Contractor as used in this Division shall mean the Heating, Ventilating, Air Conditioning, Plumbing Contractor or the Subcontractor. The word Contract as used in this Division shall mean the Heating, Ventilating, Air Conditioning, and Plumbing Contract or Subcontract.
- H. Related work specified elsewhere:
 - 1. The General Conditions, Article 1.2.3., states that the Contract Documents are complementary.
 - 2. Temporary facilities and controls are specified in Division 1, General Requirements. Cooperate in ensuring adequate protection.
 - 3. General material, equipment and workmanship standards are specified in Division 1, General Requirements.
 - 4. Excavation and backfill.
 - 5. Concrete work.
 - 6. Finish painting.
 - 7. Access doors and panels to be installed in finish surfaces.

8. See drawings for electrical wiring and connections in conjunction with this Division.

1.2 SCOPE

- A. The work to be done under this Division of the specifications shall include the furnishing of all labor, tools, equipment, supplies, supervision and all materials not specifically accepted ready for use, all Heating, Ventilating, Air Conditioning, and Plumbing Systems, equipment and associated items.
- B. It is the intent that all Heating, Ventilation, Air Conditioning, and Plumbing Work and materials necessary to complete the entire project in accordance with the Contract Plans and Specifications, whether specifically mentioned herein or not, shall be furnished. All work and materials necessary to fulfill this intent shall be supplied under the Mechanical Specifications without additional cost to the Owner.
- C. The above listing shall be taken as a general outline only, and not as a complete tabulation or description of all the work included and not in any respect limiting the work to be done under this Division of the Specifications.
- D. Each bidder shall thoroughly familiarize himself with the requirements and the intent of all Divisions of the specifications so as to include all Heating, Ventilating, Air Conditioning, and Plumbing work intended.
- E. Particular emphasis is placed on calling attention to the necessity of coordinating the mechanical work with structural requirements. The contractor is cautioned to study carefully the final plans for each of the above named Divisions.

1.3 WORK NOT INCLUDED

- A. Excavation and backfilling.
- B. All painting except that specifically called for in this Section.
- C. All chases, furred spaces, trenches, including covers, pits, foundations, etc. Contractor shall notify the General Contractor well in advance as to exact size, location, etc., to meet his requirements.
- D. All motor power wiring to equipment installed under this Division shall be done under the Electrical Division of these specifications.
- E. All cutting and patching.
- F. Toilet room accessories.

1.4 PERMITS, FEES

- A. Work under each section shall include all necessary notices, obtaining all permits and paying all governmental taxes, fees, and other costs in connection with their work; filing all necessary plans, preparation of all documents and obtaining all necessary approvals of all governmental departments having jurisdiction, obtaining all required Certificates of Inspection for the work and deliver same to the Owner before request for acceptance and final payment for the work.

PART 2 - PRODUCTS

2.1 APPROVALS AND SUBSTITUTIONS

- A. Where materials, equipment or other products are specified by manufacturer, brand name or type or catalog number, such designation is to establish standards of desired quality and style and shall be the basis of the bid. Materials so specified under the contract shall be furnished unless changed by mutual agreement with the Architect and Engineer.
- B. It is the intent of these specifications to establish quality standards of installed materials and equipment. Hence, specific items are identified by manufacturer, trade name, or catalog designation.
- C. Should the contractor propose to furnish materials and equipment other than those specified, as permitted by the "Approved Equal Clause", he shall submit a written request for any or all substitutions to the Engineer at least five (5) working days prior to bid opening. Such a request shall be an alternate to the original bid, shall be accompanied with complete description (manufacturer, brand name, catalog number, etc.), and technical data for all items and shall indicate any addition or deduction to contract price.
- D. Where no specific make of material, apparatus or appliance is mentioned, any first class product made by a reputable manufacturer may be used providing it conforms to the requirements of these specifications and meets the approval of the Architect/Engineer.
- E. When an item of equipment other than specified or detailed on the drawings is proposed which requires redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical or architectural layout, all such redesign and all new drawings and detailing required, therefore, shall, with the approval of the Architect/Engineer, be prepared under work of the respective section.
- F. Where such approved variation requires a different quantity and arrangement of ductwork, piping, wiring, conduit and equipment from that specified or indicated on the drawings, with the approval of the Architect/Engineer, furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional equipment required by the system, at no additional cost to the Owner.

2.2 SPECIAL NOTES

- A. All work shall be done by first class experienced mechanics under an experienced, competent foreman who shall superintend the work of the contractor. Said foreman shall be constantly on the premises when work under this Contract is in progress.
- B. The Architect and the Engineer will have the privilege of stopping any of the work, that in their opinion, is not being properly installed, and may demand that only competent workmen be employed and in sufficient number to complete the work.
- C. All apparatus installed under this contract shall be properly adjusted to function in the manner and at the capacities required by the engineer. Final adjustments shall not be deemed completed until the Engineer and Architect have so signified.
- D. The contractor shall examine the site and assume all responsibility for the conditions thereof.
- E. These specifications are intended to cover the furnishing, setting, testing and adjusting of all items called for.
- F. The bidder is cautioned that the Mechanical Contractor will be held responsible for the installation of all mechanical items shown and/or called for by the Architectural Plans and Specifications which might be additional to those shown and/or called for by the Mechanical Plans and Specifications.
- G. Should it be found that any piping or ductwork cannot be installed as shown on the drawings, the contractor shall consult the engineer before running pipe or making any changes.
- H. All component parts of each item of equipment or device shall bear the manufacturer's nameplate, giving name of manufacturer, description, size, type, serial or model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a subcontractor or distributor will not be acceptable.
- I. If material or equipment is installed before it is approved, it shall be removed and replaced at no extra charge to the Owner, if, in the opinion of the Architect and Engineer, the material or equipment does not meet the intent of the drawings and specifications.

2.3 ELECTRICAL MOTORS

- A. All motors 1/2 H.P. and above shall be integral horsepower polyphase induction motors conforming to NEMA Standards MS 1-1967 and shall be T-frame design in sizes 143T through 443T. Each shall be NEMA design B with minimum torque values per MG1-12.37 and 12.38.
- B. Duty shall be continuous, ambient temperature, 40 degree maximum allowable temperature rise for open drip-proof -90 degree C, TEFC - 80 degree C with Class B insulation rating all per MG1-12.42.
- C. Horsepower, speed and frame sizes per MG1-10.32, 13.02a and 13.06a.

- D. Enclosures - Open drip-proof and TEFC per MG1015, 1.26 and 1.27.
- E. All dimensions per MG1-11.31a, 11.32a and 11.34a. All motors shall have stainless steel nameplates with NEMA voltage standards shown.
- F. Locked rotor KVA per horsepower shall be designated by proper NEMA code letter per MG1-10.37.
- G. Service Factors - Open drip-proof, 1 H.P. through 200 - 1.15 TEFC all horsepowers = 1.0.
- H. Noise level within NEMA Standard MG1-12.49.
- I. In addition to the above, all motors 1 thru 20 h.p. shall be TEFC with drain holes for both horizontal and vertical positions. Each shall be equipped with deep groove double shielded ball bearings pre-lubricated with provision for regreasing.
- J. Motors smaller than 1/2 HP shall be capacitor-start or split-phase type designed for 120 volts, single phase, 60 cycles alternating current.

2.4 ELECTRIC MOTOR STARTERS

- A. All electric motor starters shall conform to requirements of AIEE, NEMA, UL, NEC and shall be suitable for required load, duty, voltage, phase, frequency, service and location.
- B. When interlocking or automatic control of single-phase motors is required, motors shall be furnished with magnetic across-the-line starters.
- C. Three phase motors shall be furnished with full voltage, magnetic, across-the-line starters, except where reduced voltage starters are indicated or required. Manufactured by Allen-Bradley, Square "D" or Cutler-Hammer.
- D. All magnetic starters shall have start-stop push buttons in cover except where interlocking or automatic or remote control is required, then starters shall have hand-off automatic selector switches in cover.
- E. All magnetic starters shall include overload and low voltage protection and one set each of normally open and normally closed contacts. Overloads shall be ambient temperature compensating type. All 3-phase starters shall have 3-leg protection.
- F. All starters shall be of same manufacturer. Coordinate with electrical contractor.
- G. All magnetic starters for new mechanical equipment shall be furnished by mechanical contractor.

PART 3 - EXECUTION**3.1 EXAMINATION OF PREMISES**

- A. The Contractor shall be assumed to have visited the site and noted all pertinent facts and details, including the conditions under which the work must be carried out, and no allowance will be made for failure to have done so.
- B. Each bidder shall thoroughly familiarize himself with the requirements and intent of all drawings of all divisions of the specifications so as to include all of the Heating and Ventilation, Air Conditioning, and Plumbing Work intended.

3.2 DRAWINGS AND COORDINATION

- A. It is not the intention of the drawings to show every item, piece of equipment and detail. Provide complete, operating systems.
- B. Install work as closely as possible to layouts shown on drawings. Modify work as necessary to meet job conditions and to clear other equipment. Consult Architect before making changes which affect the function or appearance of systems.
- C. Dimensions, elevations, and locations are shown approximately. Verify dimensions in field.
- D. Architect reserves the right to order changes in layout of such items as piping, ducts, and equipment if such changes do not substantially affect costs and if affected items have not been fabricated or installed.
- E. In some cases, drawings are based on products of one or several manufacturers, as listed on Contract Documents. The contractor shall be responsible for modifications made necessary by substitution or products of other manufacturers.
- F. Do not install part of a system until all critical components of the system and related systems have been approved. Coordinate parts of systems.
- G. Coordinate work with work specified in other sections. Relocate work if required for proper installation and functioning of other systems.
- H. Install products in accordance with manufacturer's instructions. Notify Architect if Contract documents conflict with manufacturer's instructions. Comply with Architect's interpretations.
- I. Provide brackets, supports, anchors and frames required for installation of work specified in this division.

3.3 MEASUREMENTS

- A. All measurements taken at the building shall take precedence over scale dimensions. Every part of the plans shall be fitted to the actual conditions at the building.

3.4 COORDINATION AND SCHEDULING

- A. The contractor will be held responsible for any chases, holes, cutting or changes in work already done which may become necessary due to his failure to properly coordinate the work under this Division with all other Divisions of the specifications.
- B. The contractor shall furnish the electrical contractor with wiring schematics, at the proper time, for all mechanical equipment and controls requiring connections.

3.5 BALANCING OF SYSTEM

- A. The Contractor shall provide for sufficient time and instrumentation by skilled technicians to balance all systems to effect maximum operational efficiency.

3.6 SHOP DRAWINGS

- A. Prior to delivery to job site, but sufficiently in advance of requirements necessary to allow Architect and Engineer ample time for review, contractor shall submit for approval, seven (7) copies each of shop drawings of all equipment.
- B. Shop drawings shall consist of manufacturer's certified scale drawings, cuts, or catalogs, including descriptive literature and complete certified characteristics of equipment, showing dimensions, capacity, code requirements, motor and drive, testing, as indicated on the drawings or specifications. Also, sheet metal fabrication drawings drawn to a scale of 1/4" to the foot or larger.
- C. Certified performance cures for all pumping equipment shall be submitted for approval.
- D. Samples, drawings, specifications, catalogs, etc., submitted for approval shall be properly labeled indicating specific service for which material or equipment is to be used, division and article number of specifications governing contractor's name and name of job.
- E. Catalog, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc., of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.
- F. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail. Said approval does not, in any way, relieve the contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.
- G. Failure by the contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time, and no claim for extension by reason of such default will be allowed.

- H. Prior to submission of shop drawings, the contractor shall thoroughly check each shop drawing, reject those not conforming to the specifications, and indicate by his signature that the shop drawings submitted, in his opinion, meet contract requirements.

3.7 LIST OF PROPOSED SUBCONTRACTORS

- A. It is the intent of the Owner to exercise his prerogative as outlined in the Architectural portion of this specification inclusive regarding the approval of all subcontractors and suppliers. Any subcontractor and/or supplier, who, in the opinion of the Owner and Architect, is not qualified either by organization or performance in other projects, will not be approved. It shall be further understood that the Owner will not, under any circumstances, allow any additional cost to the General Contractor's Base Price in order to obtain subcontractors and/or suppliers whose qualifications meet the approval of the Owner and Architect.

3.8 PROTECTION

- A. Work under each section shall include protecting the work and material of all other sections from damage by work or workmen, and shall include making good all damage thus caused.
- B. Each section shall be responsible for work and equipment until finally inspected, tested and accepted; protect work against theft, weather, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

3.9 SCAFFOLDING, RIGGING, HOISTING

- A. Unless otherwise specified, the work under each Section shall include all scaffolding, rigging, hoisting and services necessary for the erection and delivery onto the premises of any equipment and apparatus furnished. Remove same from the premises when no longer required.

3.10 ACCESSIBILITY

- A. Locate all equipment which must be serviced, operated or maintained in full accessible positions. Equipment shall include, but not be limited to motors, controllers, switchgear, drain points, etc. If required for better accessibility, furnish access doors for this purpose. Access doors shall be selected by the Architect/Engineer to specific area finishes. Minor deviations from drawings may be made to allow for better accessibility, only if approved by the Architect/Engineer.
- B. Access doors shall be of sufficient size to permit easy replacement of complete units and all groupings of valves and equipment shall have necessary clearance for this same purpose.

3.11 LUBRICATION

- A. All equipment having moving parts and requiring lubrication which is installed under this contract, shall be properly lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication

is subject to rejection and replacement at no cost to the Owner. Units furnished with sealed bearings are excepted.

3.12 EQUIPMENT AND APPARATUS FOUNDATIONS

- A. Except where specifically noted to the contrary, all masonry bases and foundations for equipment will be provided by the General Contractor with necessary anchor bolts, washers, templates, etc., furnished by this contractor. Bolts shall be built into foundations with properly sized sleeves. Bases for all moving equipment shall be satisfactorily isolated from building structure by approved isolations.

3.13 OWNER'S INSTRUCTIONS AND SYSTEM OPERATION

- A. At the time of the job's acceptance by Owner, contractor shall furnish one complete set of approved certified drawings to the Owner. In addition, contractor shall furnish maintenance and operating instructions for all equipment. These instructions shall be written in layman's language and shall be inserted in vinyl-covered three-ring loose-leaf binder. This information in binder shall be first sent to and approved by the Architect/Engineer before turning over to Owner.
- B. Upon completion of all work and of all tests, each division shall furnish the necessary skilled labor and helpers for operating the system and equipment for a period of one day of eight (8) hours, or as otherwise specified. During this period, instruct the Owner or his representative(s) fully in the operation, adjustment and maintenance of all equipment furnished. Give at least 48 hours notice to the Owner in advance of this period.

3.14 QUIET OPERATION

- A. Mechanical equipment shall operate without objectionable noise or vibration as determined by the Architect/Engineer. Noise level in any normally occupied area shall not exceed that of an "NC-35" curve (noise criteria-35) as established in latest edition of the ASHRAE Guide.
- B. If such objectionable noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, piping, ducts or other parts of the mechanical work, such changes or additions as are necessary shall be made as approved, without extra cost to the Owner.

3.15 CLEANING, PIPING, DUCTS AND EQUIPMENT

- A. Thoroughly clean all piping, ducts and equipment of all foreign substances inside and out before being placed in operation.
- B. If any part of a system should be stopped by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

3.16 PROJECT RECORD DRAWINGS

- A. Note that the General Conditions and Division 1, General Requirements specify that project record drawings be prepared. Conform to the requirements of Division 1, General Requirements.

3.17 EQUIPMENT CLEARANCES

- A. Deliver equipment knocked down if necessary to place it in proper position.
- B. Install equipment with adequate clearances for maintenance and operation both of the equipment and of adjacent equipment.

3.18 PRELIMINARY OPERATION

- A. Operate mechanical systems with required supervision for at least two full days prior to substantial completion. Make necessary adjustments, and check proper operation.

3.19 TESTS PRIOR TO SUBSTANTIAL COMPLETION

- A. Tests shall be attended by representatives of mechanical subcontractors, equipped with instruments required to demonstrate proper functioning of systems, as specified. Demonstrate the following:
 - 1. Equipment installed and operating in accordance with manufacturer's specifications and instructions and with these specifications.
 - 2. Safety and temperature controls operating as specified.
 - 3. Systems properly flushed, cleaned, and free of contaminants.
 - 4. Systems properly balanced.
 - 5. Motors equipped with proper overload protection and not operating under overload. Obtain ammeter readings.
 - 6. Instruments recording properly.
- B. Submit report listing system tested, date, results, and description of fault corrections, if any.

3.20 WARRANTY

- A. Submit written warranty or warranties covering work specified in Division 15. Warranty period shall be one year from the date of Substantial Completion of the building, or of the equipment being warranted, whichever is later. Owner is to receive full use of equipment for period of warranty.

3.21 FIELD QUALITY CONTROL

- A. Test piping systems hydrostatically at 150% of expected working pressure unless otherwise specified.
- B. Reports shall list systems tested, date, results, description or correction of faults, and witnesses.
- C. Maintain tests 4 hours unless otherwise specified.
- D. Perform preliminary tests before witnessed tests.
- E. Give Architect 48 hours notice of tests. Architect will observe tests.

END OF SECTION 15010

SECTION 15020 – CODES AND STANDARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section shall include all Codes and Standards that apply to heating, ventilating, air conditioning, and plumbing trades.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards.
- D. General requirements for Mechanical work.

1.3 CODE REQUIREMENTS

- A. All work, equipment and materials under this Division of the specifications shall comply strictly with the 2005 State of Connecticut Basic Building Code, and 2009 Amendments, 2005 State Fire Safety Code, U.L., N.E.M.A., O.S.H.A., N.F.P.A., B.O.C.A., A.N.S.I., A.D.A., International Plumbing code, International Mechanical Code, and with all requirements of all governmental departments having jurisdiction, and requirements of local utility companies. Requirements of the above shall take precedence over plans and specifications.

1.4 GUARANTEE

- A. All parts of the work shall be guaranteed for a period of one (1) year from date of acceptance of the job by the Owner. If during that period of general guarantee, any part of the work installed fails, becomes unsatisfactory or does not function properly due to any fault in material or workmanship whether or not manufactured, or job built, each section shall, upon notice from the Owner, promptly proceed to repair or replace such faulty material or workmanship without expense to the Owner, including cutting, patching and painting, or other work involved, and including repair or restoration of any damaged sections of the premises resulting from such faults.
- B. In the event that a repetition of any one defect occurs indicating the probability of further failure and which can be traced to faulty design, material or workmanship, then repairs or replacement shall not continue to be made, but the fault shall be remedied by a complete replacement of the entire defective unit.

- C. In addition to general guarantee, obtain and transmit to the Owner, any guarantees or warranties from manufacturers of specialties, but only as a supplement to the general guarantee which will not be invalidated by same.

1.5 CONTROLLING STANDARDS

- A. All equipment, materials and work shall comply strictly with the applicable requirements of Controlling Standards listed below:

ITEM	STANDARDS
1. Pressure Temperature, Pressure Relief Valves, Reducing Valves.	A.S.M.E., State and Local Codes and authorities.
2. Steel Pipe	A.S.T.M. - A33, A-210
3. Wrought Iron Pipe	A.S.T.M. - A72
4. Copper Tubing	A.S.T.M. - 88
5. Pipe Fittings	A.S.A. - 16
6. Ductwork	A.S.H.R.A.E.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All equipment and materials shall be new and of first quality, suitable for the purpose intended and conditions encountered.
- B. All work shall be performed in neat and workmanlike manner, with due regard for good practice and best finished appearance.
- C. All unsatisfactory work, equipment or materials shall be corrected or replaced at once, without cost to the Owner.
- D. Every part of the plumbing installation shall be tested as required by the Engineer and left in proper working order.
- E. The contractor shall furnish the electrical contractor with wiring schematics, at the proper time, for all Plumbing or H.V.A.C. equipment and controls requiring connections.

PART 3 - EXECUTION

3.1 TESTS AND INSTALLATION

- A. Make all tests as required by Code or Ordinance and as hereinafter specified. File with the Architect, written reports in triplicate for all such tests. Tests shall be made in the presence of the Owner's representative and in manner approved by him.
- B. Test sanitary drainage, storm water and venting systems with water or air at least as follows:

Water Test: Apply water test to drainage system either in its entirety or in sections. If applied to entire system, tightly close all openings in piping except highest and fill system with water to point of overflow. If system is tested in sections, tightly plug each opening except highest opening of section under test, and fill section with water. In testing successive sections, at least upper 10 feet of next preceding section shall be tested, so that no joint or pipe in building (except uppermost 10 feet of system) shall have been submitted to a test of less than a 10 foot head of water. Keep water in system or in portion under test, for at least 15 minutes before inspection starts; system shall then be tight at all points.

Air Test: Apply air test by attaching an air compressor testing apparatus to any suitable opening, and, after closing all other inlets and outlets to system, forcing air into system until there is a uniform gauge pressure of 5 pounds per square inch or sufficient to balance a column of mercury 10 inches in height. This pressure shall be held without introduction of additional air for a period of at least 15 minutes.

- C. Test water piping under hydrostatic pressure of 200 psi for at least 4 hours.

3.2 DISINFECTION OF POTABLE WATER PIPING

- A. Complete and effective disinfection of potable water piping systems after testing and acceptance.
- B. Water Piping: Disinfect after flushing with clean water by filling entire system or any part thereof with water solution containing at least 50 part per million of available chlorine. Allow solution to stand in system at least 24 hours before flushing out with clean potable water.
- C. In lieu of above, swab water contacting surfaces with solution containing at least 200 parts per million of available chlorine. Allow solution to stand in system for at least three hours before flushing out with clean potable water.

3.3 PROTECTION OF POTABLE WATER SUPPLY

- A. Protect potable water supplies against backflow, back-siphonage, cross connection and other unsanitary conditions.

- B. Do not directly connect potable water to, or run within, any piping or device containing or conveying sewage, wastes, or other materials hazardous to health and safety.
- C. Equip plumbing fixture supplies, other than "over-rim" type, with approved vacuum breakers or air gap fittings. Supplies equipped for hose connection must have integral vacuum breakers.

END OF SECTION 15020

SECTION 15050 – MECHANICAL SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. All devices and auxiliary steel to support all pipes and ducts.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards.
- D. General requirements for Mechanical work..

1.3 SUBMITTALS

- A. Submittal requirements and procedures are specified in Section 01330.
- B. Submit manufacturer's data and cuts for materials specified herein.

1.4 QUALIFICATIONS

- A. All pipe hangers shall be Grinnel, Carpenter Patterson or approved equal.

PART 2 - PRODUCTS

2.1 PIPE HANGERS

- A. Pipe hangers, anchors and inserts shall comply with installation requirements of the National Plumbing Code, B.O.C.A., and N.F.P.A., and the work shall include, but is not limited to the following:
 - 1. Hangers for all piping shall be clevis or split ring type except where three or more pipes run parallel at the same elevation or grade, a tee for vertical adjustment. Hangers supporting copper tubing shall be copperplates steel or brass or bronze. Hanger rods shall be steel 3/8" diameter supporting pipes 2" and smaller, 1/2" diameter supporting pipes 2-1/2" to 4 inches.
 - 2. Hangers shall be installed to support the piping from the building structure to maintain the required grade and pitch of the pipe lines, prevent vibration, secure the piping in place, and

provide for expansion and contraction. Hangers shall be secured to inserts wherever practical. Install hanger for each length of floors. Hangers and supports for equipment shall be installed with approved bolts and inserts; wood plugs shall not be used.

3. No chair or band iron hangers will be allowed. Keep all piping clear of access hatches. Coordinate locations of all pipe runs with all trades.

2.2 DUCT HANGERS

- A. Ducts shall be supported in a substantial manner from building construction.
- B. Hangers for horizontal ducts shall be 1" wide X 16 gauge steel minimum.
- C. Supports for vertical ducts shall be 1-1/2" angle irons bolted to ducts and set on steel or other structural members.
- D. Hangers and supports shall be installed per SMACNA HVAC Duct Construction Standards.

2.3 PIPE EXPANSION

- A. All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Swing joints, expansion loops and expansion joints with proper anchors and guides shall be provided where necessary and/or when shown on the drawings. Anchors and guides shall be subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Examine all parts of the existing supporting structures and the conditions under which the work is to be installed.
- B. Anchoring and fastening must be carried out by recognized standards.

END OF SECTION 15050

SECTION 15060 – VIBRATION ISOLATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Equipment and materials to isolate all piping, ductwork and equipment from building structure.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards.
- D. General requirements for Mechanical work.

1.3 SUBMITTALS

- A. Submittal requirements and procedures are specified in Section 01330.
- B. Submit manufacturer's data and cuts for materials specified herein.

1.4 QUALIFICATIONS

- A. Particular attention of the mechanical contractor is directed to preventing noise and vibration transmission from the equipment to adjacent areas. The noise and vibration control apparatus shall be obtained from one company that is engaged in the design, development and manufacture of both vibration and sound control products. If isolators and acoustical products other than those specified herein are used, detailed calculations must be presented to the Architect/Engineer to prove equivalence, two (2) weeks prior to the closing date.
- B. Selection of specified isolator sizes shall be made upon final selection of mechanical equipment by the Engineer.

PART 2 - PRODUCTS

2.1 WALL PENETRATION

- A. Wherever a duct penetrates a wall or partition, a resilient material shall be introduced between duct and wall. This material shall be fire resistant material in accordance with NFPA Standards and meet state and local Fire Marshal's approval.

2.2 FLEXIBLE CONNECTIONS

A. Flexible Duct Connectors (FDC)

1. The flexible duct connector shall be fibrous glass fabric coated with an inorganic elastomeric compound suitable for installation in required locations. The connector, as installed, shall comply with NFPA 90A and UL 214 and shall be classified as "flame retarded fabrics" in Part II, UL Building Materials Directory.
2. The clear length of connection, between the sheet metal duct section and the fan housing, or between sections of duct, shall be at least 3 inches. The connector shall be at least 1 times the clear length of the connection.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Unless otherwise indicated, bolting of vibration isolator to the floor is not required.
- B. Air handling equipment should be erected on isolators and leveled with fan operating before duct connection is made to insure that ducting position is in proper alignment and providing proper clearance in proportion to flexible duct connector length. When fan is shut off, misalignment with ductwork is allowable providing it does not strain or damage flexible duct connector.
- C. Submittal drawings shall be made for approval and shall state performance or vibration control products such as isolator static deflection under load.
- D. All mechanical equipment shall be vibration isolated in accordance with recommendations by the unit manufacturer.
- E. Flexible Duct Connection - Sheet metal duct and plenum openings shall be squarely aligned with the fan discharge, fan intake, and adjacent duct section before the connection is installed. The flexible duct connection is approximately equal at all points around the perimeter. It shall be possible for the fan unit or adjacent duct section to move 1 inch in any direction without short circuiting or stretching the flexible connection taut.

END OF SECTION 15060

SECTION 15070 – SEISMIC RESTRAINTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. It is the intent of this specification to provide the basis of seismic design for every mechanical system including piping and ductwork within the building. Provide seismic restraints, per Connecticut State Building, International Building Code, IMC and IPC.
- B. The work of this section includes, but is not limited to the following:
 - 1. Seismic restraints for isolated piping, equipment and ductwork.
 - 2. Seismic restraints for isolated and non-isolated piping, equipment and ductwork.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards.
- D. General requirements for Mechanical work.

1.3 SUBMITTALS

- A. Submittal requirements and procedures are specified in Section 01330.
- B. Submit manufacturer's data and cuts for materials specified herein.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 GENERAL

- A. All equipment, whether isolated or not, shall be bolted to structure to allow for minimum 1/2 G of acceleration.
- B. All structurally suspended overhead equipment isolated or non-isolated shall be four point independently braced seismic restraining system.
- C. Install seismic restraining system taut for overhead suspended non-isolated equipment, piping or ductwork and slack with 1/2" cable deflection for isolated systems.
- D. Seismically restrain all piping and ductwork in accordance with guideline as outlined below.
 - 1. Piping, Schedule 10, 20 or 40 weld or victaulic braced at 40 foot intervals and at turns of more than 4 feet. Lateral bracing 80 intervals. No hub piping to be braced at 20 feet intervals or 40 feet using 1/2 G acceleration rated couplings.
 - 2. Ductwork to be braced every 30 feet and at every turn and duct run ends. Lateral bracing every 60 feet.
- E. If equipment is mounted on housekeeping pads, pads to be properly doweled or expansion shielded to deck to meet acceleration criteria.
- F. For overhead supported equipment, over stress of the building structure must not occur. Bracing can occur from:
 - 1. Flanges of structural beams.
 - 2. Upper or lower truss chords in bar joist construction at the panel points.
 - 3. Cast in place inserts or drilled and shielded inserts in concrete structures.
- G. Pipe risers through cored shafts require no further seismic bracing. (Core diameter to be maximum 2" larger than pipe O.D.).

END OF SECTION 15070

SECTION 15100 – VALVES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Valves for plumbing systems.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards.
- D. General requirements for Mechanical work.

1.3 SUBMITTALS

- A. Submittal requirements and procedures are specified in Section 01300.
- B. Submit manufacturer's data and cuts for materials specified herein.

1.4 QUALIFICATIONS

- A. Valves shall be as manufactured by Milwaukee, or Apollo as noted below and shall be suitable for service in which they are used.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Install all globe, cocks, check, etc., valves as shown, all others for the plumbing system shall be two piece full port bronze ball type, Milwaukee or Apollo.
 - 1. Domestic water system, all valves 2" and smaller shall be two piece, full port ball type, bronze, Milwaukee or Apollo.

2. Hose and drain valves are to be provided at any low point that may require draining.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Identification tags shall be provided on all valves installed in the heating and plumbing systems. Each tag shall be fastened to the valve body with figure eight hooks.

END OF SECTION 15100

SECTION 15120 – SOIL, WASTE, AND VENT PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Work included: The sanitary soil and waste system shall include all plumbing drains, soil, waste and vent piping, connections to each fixture, connections to sanitary piping and all accessory items required.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards.
- D. General requirements for Mechanical work.

1.3 SUBMITTALS

- A. Submittal requirements and procedures are specified in Section 01330.
- B. Submit manufacturer's data and cuts for materials specified herein.

1.4 QUALIFICATIONS

- A. All work, equipment and materials under this Division of the Specifications shall comply strictly with all applicable codes and shall meet with the approval of all State and Local Officials having jurisdiction. Requirements of the above, as well as the requirements of water and power companies, shall take precedence over plans and specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Unless otherwise specified, all materials furnished and installed under this Division shall be new and of the best quality. Manufactured materials and equipment shall be delivered to the job site

and stored in their original containers plainly marked with the brand and the maker's name. Materials and equipment in unmarked or damaged containers may be wholly rejected.

2.2 SOIL, WASTE, AND VENT PIPING

- A. All soil, waste and vent piping within building may be service weight cast iron with no-hub fittings with four bands per fitting, D.W.V. copper with solder joints on 1-1/2" and 2" waste lines or PVC. Fittings on plastic piping with solvent cemented fittings conforming to ASTM D2235.
- B. Exposed lavatory waste piping shall be C.P. brass.
- C. Flash all vents at roof with #2 lead turned down 3" into top of pipe. Exposed vents shall have one piece construction at floor of sill. Two pieces are allowable at ceiling or high on wall only.
- D. Run all soil, waste and vent piping shown or required by local code. Piping shown is minimum and in accordance with state and federal codes. If local codes require additional venting or larger sizes, same shall take precedence.
- E. Make all connections through approved traps. Each trap to be vented, either by circuit loop or by individual vent, as required, but not less than shown or as required by local code.
- F. Cleanouts shall be installed at base of all stacks, at all changes of direction, and in long lines, if necessary, to provide means of cleaning lines at maximum 50 ft. intervals.
- G. Pitch horizontal piping 1/4" per foot unless noted otherwise on plans.

2.3 CLEANOUTS

- A. Provide cleanouts at changes of direction and otherwise where shown or required. Cleanouts shall be not more than 50 feet apart.
- B. Cleanouts shall have brass plugs.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Run all soil, waste and vent piping shown or required by local code. Piping shown is minimum and in accordance with State and Federal Codes. If local codes require additional venting or larger sizes, same shall take precedence.
- B. Make all connections through approved traps. Each trap to be vented, either by circuit loop or by individual vent, as required, but not less than shown or as required by local code.

- C. Cleanouts shall be installed at base of all stacks and at all changes of direction.

END OF SECTION 15120

SECTION 15260 – PIPING AND EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work described in this division shall be governed by all the conditions of Division 1, "General Requirements", "General Conditions" and "Supplementary Conditions" as well as all plans, specifications and all addenda issued during the bidding period.
- B. The attention of each bidder is hereby directed to the "Instructions to Bidders", for he will be required to comply with all the terms and conditions set forth therein.
- C. The submission of a Mechanical Contract Proposal to the G.C. shall be deemed as evidence that this Contractor is aware of all the requirements and instructions contained in Division 1.
- D. Furnish and install thermal insulation on all piping, equipment and ductwork that transmit heat, permits heat loss or gain, or will form condensation. No piping, equipment or ductwork shall be insulated until tested and approved for tightness and distribution.
- E. Special attention shall be given to insulation of all water piping exposed to outside walls, in joist space above ceiling.
- F. Experienced specialists shall be employed for installation of all insulations.
- G. All pipe covering shall fit snugly.
- H. All covering on pipes running through walls, floors and partitions shall be continuous through sleeves and openings except at fire rated walls and slabs.
- I. All surfaces shall be dry and clean when insulation is applied.
- J. Laps on longitudinal and butt joints shall be pasted down with a moisture proof adhesive. Longitudinal joints shall be on least conspicuous side of the pipe. Adhesives, fire retardant when dry.
- K. Surface imperfections such as chipped edges and small voids or holes shall be filled with like insulation material or with insulating cement.
- L. Special care shall be exercised in insulating cold water lines to prevent sweat leaks at hanger locations.

- M. Pipe hangers as hereinbefore specified shall be installed outside of the insulation and where hangers occur prefabricated insulation protective saddles with load bearing surface of equal thickness with insulation shall be installed. These protective saddles shall be equivalent to Insul-Coustic Corp. "Insul-Shields" and shall be furnished and installed by the Mechanical Contractor during the course of erection of the piping.
- N. Insulation installation shall allow for the firesafing of all piping sleeves penetrating slabs and fire rated walls. After the sleeves are firesafed, install the insulation tight against the fire safing. Seal the vapor barrier insulation at the junction of the wall or slab and firesafing.
- O. Insulation for factory fabricated air handling units furnished as part of units.
- P. Fibrous glass insulation, calcium silicate insulation, foamed glass and foamed plastic shall be similar to products of Owens-Corning Fiberglas, Certain-Teed, Johns Manville or Pittsburgh-Corning.
- Q. Duct linings, coverings, vapor barriers, pipe covering and adhesive used to apply them shall have a flame spread rating not more than 25 and a smoke developed rating not more than 50 for ductwork and 50 for piping as tested under procedure ASTM E - 84, NFPA 225 and U.L. 723.

1.2 SUBMITTALS

- A. Submittals Requirements and Procedures are specified in Section 01300.

PART 2 - PRODUCTS

2.1 PLUMBING PIPING INSULATION

- A. Products shall be "Manville", "Owens-Corning" or "Certain-Teed".
 - 1. Insulate all hot and cold water piping with 1" thick heavy density fiberglass 25 ASJ with vapor barrier and lap adhesive jacket. Insulation on fittings shall be fiberglass with pre-molded jacket.
 - 2. Fittings, valves and flanges: (Excluding cold water) shall be insulated with premolded fiberglass fittings wired on and covered fiberglass cloth and brush coated with Benjamin Foster 30-36 at manufacturer's consistency.
 - 3. Fittings, valves and flanges for cold water shall be insulated with pre-molded fiberglass fittings of same thickness as pipe insulation, wired on and a vapor barrier cement brushed glass tape and a second (B.J. 30-36) coat of cement. Joints sealed with vapor barrier adhesive.
- B. All insulation shall comply with latest N.F.P.A. standards.

2.2 DUCTWORK INSULATION

- A. All unlined supply and return air ductwork in Basement shall be insulated with nominal 2" thick minimum R=5 Type 100 Fiberglass duct wrap with FRK vapor retarder facing.
- B. All supply and return air ductwork in unheated attic space shall be insulated with nominal 3" thick minimum R=8 Type 75 fiberglass duct wrap with FRK vapor retarder facing.
- C. All flexible Fiberglass duct insulation shall be applied in sections cut long enough to wrap around the duct to meet snugly without stretching. Insulation shall be adhered to ducts with Benjamin Foster #81-60 adhesive applied in strips 8" wide on approximately 12" centers. All pieces shall be butted tightly at the joints which shall be sealed with continuous strips of 4" wide Permacel adhesive tape. Provide Graham pins for bottom.
- D. Supply proper openings in the covering at access doors in ductwork. Access doors in casings shall be the insulated panel type.
- E. All insulation shall comply with latest NFPA standards.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install insulation according to manufacturer's instructions and recommendations.
- B. Fittings shall be insulated by applying the proper factory precut insulation insert to the pipe fitting. The ends of the insulation insert shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe insulation tufted and tucked in, fully insulating the pipe fitting. The Zeston 2000 PVC fitting cover is then applied and shall be secured by tack fastening, banding or taping the ends to the adjacent pipe insulation.
- C. All flexible fiberglass duct insulation shall be applied in sections cut long enough to wrap around the duct to meet snugly without stretching. Insulation shall be adhered to ducts with Benjamin Foster #81-60 adhesive applied in strips 8" wide on approximately 12" centers. All pieces shall be butted tightly at the joints which shall be sealed with continuous strips of 4" wide Permacel adhesive tape. Provide Graham pins for bottom.
- D. Supply proper openings in the covering at access doors in ductwork. Access doors in casing shall be the insulated panel type.
- E. It is the intent of these Specifications that all vapor barriers be completely sealed against moisture penetration.

- F. All duct openings penetrating floor slabs, partitions, walls, etc., shall be packed with fiberglass and sealed with non-hardening mastic.

END OF SECTION 15260

SECTION 15410 – PLUMBING PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. All specialties in Plumbing Division.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards.
- D. General requirements for Mechanical work.

1.3 SUBMITTALS

- A. Submittal requirements and procedures are specified in Section 01330.
- B. Submit manufacturer's data and cuts for materials specified herein.

1.4 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section apply to this Section.
- B. The attention of each bidder is hereby directed to the "Instructions to Bidders", for he will be required to comply with all the terms and conditions set forth therein.
- C. The submission of a Mechanical Contract Proposal to the G.C. shall be deemed as evidence that this Contractor is aware of all the requirements and instructions contained in Division 1.

1.5 QUALIFICATIONS

- A. See individual items for manufacturer qualifications.

PART 2 - PRODUCTS**2.1 ESCUTCHEONS**

- A. All piping through walls, floors or ceilings shall have sleeves and escutcheons where exposed. Escutcheons shall be chromium-plated steel.

2.2 WATER PIPING - INTERIOR

- A. All water piping within the building shall be Type "L" copper tubing with sweat type wrought fittings and all joints shall be made with 95-5 solder or stay-safe bridget lead-free solder.
- B. Provide air cushions or Zurn-Shoktrol at each group of fixtures as indicated or required by good practice.
- C. Provide section cutoff valves on all main branches.
- D. Pitch and valve all water piping for convenient drainage.
- E. All pipes shall be reamed to full area before installation and blown clean of chips and dirt.
- F. Wherever copper or brass alloy is connected to galvanized metal, the two shall be separated with an "insulation" connection fitting.
- G. Piping shall be concealed in furred space of occupied areas or chases wherever construction permits. Contractor shall obtain permission of the Architect to run exposed pipes not specifically shown on the drawings as exposed.
- H. Where horizontal branch pipe mains, branches, or risers are exposed in finished areas, they shall be fitted with a two-piece floor and ceiling plate having a dull satin chrome plate finish.
- I. Where mains, branches and risers pass through the partitions or walls, they shall be surrounded with a cast iron or standard steel pipe thimble or sleeve with at least 1/2" clearance between pipe and sleeves. Sleeves to finish flush to wall. This contractor to be responsible for setting and properly locating sleeves.

2.3 GASKETS

- A. For fixture outlets to floor flanges, gaskets shall conform to Federal Specifications HH-G-536 (a) Type 2.
- B. For cast-iron soil pipe fittings, gaskets shall conform to American Society Testing Material C564.

2.4 NIPPLES

- A. Nipples shall be the same material as the pipe or tubing with which they are installed and shall conform to Federal Specification WW-N-351. When unthreaded section is less than one inch, the nipple shall be extra strong. Close or running thread type nipple in ferrous piping shall not be used.

2.5 JOINTING COMPOUND

- A. Threaded and flanged jointing compound shall be made up of pipe cement and oil or graphite and oil.
- B. Fixture setting compound shall conform to Federal Specifications HH-C-536.

2.6 ECCENTRIC REDUCERS

- A. Eccentric reducers shall be used in all reductions wherever required for venting or drainage of the system. Field fabricated reducers will not be acceptable.

2.7 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. Each section shall provide and shall be held responsible for the location and position of all sleeves, inserts and anchor bolts required for the work. Failure to do so which requires cutting and patching of finished work shall be done at no additional cost to the contract.
- B. All sleeves shall be packed with fiberglass or oakum and sealed. Sealant shall allow for movement without cracking and shall be "3M" CP 25S/L self-leveling intumescent caulk.
- C. Inserts shall be individual or strip type of steel or malleable iron construction for removable nuts and threaded rods up to 3/4" diameter, permitting lateral adjustment.

2.8 FUEL OIL PIPING

- A. Extend existing copper fuel oil piping to new oil fired furnace located in approximately the same location as the (removed) boiler. Modify/extend piping as required.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Wherever copper or brass alloy is connected to galvanized metal, the two shall be separated with an "insulation" connection fitting of wrought iron or cast steel.
- B. Piping shall be concealed in furred space of occupied areas or chases wherever construction permits. Contractor shall obtain permission of the Architect to run exposed pipes not specifically shown on the drawings as exposed.
- C. Where horizontal branch pipe mains, branches, or risers are exposed in finished areas, they shall be fitted with a two-piece floor-and-ceiling plate having a dull satin chrome plate finish.
- D. For all exposed vertical risers, provide one piece of #12 Beaton and Cadwell escutcheons at floor. Use steel pipe for sleeves. Two-piece escutcheons may be used at ceiling.
- E. Piping shall be supported from adjustable split-ring hangers (similar metal type) secured to inserts provided and installed by the Plumbing Contractor.

- F. Provide air cushions or Zurn-Shoktrol at each group of fixtures as indicated or required by good practice.
- G. Provide section cutoff valves on all main branches or as shown.
- H. Pitch and valve all water piping for convenient drainage.
- I. All pipes shall be REAMED to full area before installation and blown clean of chips and dirt.
- J. Where mains, branches and risers pass through the partitions or walls, they shall be surrounded with a cast iron or standard steel pipe thimble or sleeve with at least 1/2" clearance between pipe and sleeves. Sleeves to finish flush to wall. This contractor to be responsible for setting and properly locating sleeves.
- K. All work, equipment and materials under this Division of the specifications shall comply strictly with all applicable codes and shall meet with the approval of all state and local officials having jurisdiction. Requirements of the above, as well as the requirements of water and power companies, shall take precedence over plans and specifications.

END OF SECTION 15410

SECTION 15440 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Plumbing fixtures.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards.
- D. General requirements for Mechanical work.

1.3 SUBMITTALS

- A. Submittal requirements and procedures are specified in Section 01300.
- B. Submit manufacturer's data and cuts for materials specified herein.

1.4 QUALIFICATIONS

- A. The following fixtures may be furnished in Crane, Kohler or American Standard as approved; all white except as noted, complete with chrome plating on exposed iron or pipe, traps, anchor bolts, hangers, strainers, loose key stop valves at every fixture, faucet and other incidental items furnished as standard. Kohler numbers are specified unless noted otherwise.
- B. The attention of each bidder is hereby directed to the "Instructions to Bidders", for he will be required to comply with all the terms and conditions set forth therein.
- C. The submission of a Mechanical Contract Proposal to the G.C. shall be deemed as evidence that this Contractor is aware of all the requirements and instructions contained in Division 1.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURE SPECIFICATIONS

- A. For Plumbing Fixture Specifications, see Schedule on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The plumbing contractor shall furnish and install all fixtures in accordance with the drawings and the schedule.
- B. All fixtures are to be first quality, free of cracks, blemishes or other imperfections and to be "acid resisting" quality.
- C. Set and properly connect all fixtures with hot and cold water, vent and drainage piping and other services as required and protect fixtures until final acceptance and test. Clean all flush valves after two weeks operation.
- D. All piping through walls, floors or ceilings shall have sleeves. Exposed chrome piping shall have chrome escutcheons at wall or floor penetrations.
- E. The Owner and the Architect shall be the final judge as to whether the fixture fulfills the requirements of the specifications, and as to whether they are of suitable quality. The plumbing contractor shall furnish, set and connect all fixtures and accessories shown and specified to fully complete the plumbing installation.
- F. Unless otherwise specified, all materials furnished and installed under this Division shall be new and of the best quality. Manufactured materials and equipment shall be delivered to the job site and stored in their original containers plainly marked with the brand and the maker's name. Materials and equipment in unmarked or damaged containers plainly marked with the brand and the maker's name. Materials and equipment in unmarked or damaged containers may be wholly rejected.

END OF SECTION 15440

SECTION 15890 – DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install a complete ductwork system including the following: Supply, return, exhaust and outside air ductwork, underground ductwork, fire dampers, access doors, duct liner, and accessories of sizes shown on drawings or required to perform as specified.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Related Work Specified Elsewhere:
 - 1. The General Conditions state that the Contract Documents are complementary.
 - 2. Temporary facilities and controls are specified in Section 01500. Cooperate in ensuring adequate protection.
 - 3. General material, equipment, and workmanship standards are specified in Section 01600.

1.3 SUBMITTALS

- A. Submittal requirements and procedures are specified in Section 01330.
- B. Submit manufacturer's data and cuts for materials specified herein.

1.4 QUALIFICATIONS

- A. See individual items for manufacturer qualifications.

PART 2 - PRODUCTS

2.1 DUCT MATERIALS AND SEALANTS

- A. General: Except for systems specified otherwise, construct ducts, casings and accessories of galvanized sheet metal, ASTM A527, coating G90.
- B. Joint Sealing: Refer to SMACNA LPDS, Table 1-2 and HPDS, Chapter 5.
 - 1. Sealant: Elastomeric compound, gun or brush grade, maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork. Use products as recommended by the manufacturer for low, medium or high pressure systems. Generally,

provide liquid sealant, with or without compatible tape, for low clearance slip joints and heavy, permanently elastic, mastic tape where clearances are larger. Oil base caulking and glazing compounds are not acceptable because they do not retain elasticity and bond.

2. Tape: Use only tape specifically designated by the sealant manufacturer. SMACNA recommends that foil tape not be used and that pressure sensitive tape not be used on bare metal or on dry sealant.
3. A few of the many satisfactory sealants are as follows:
 - a. Moore Tuff-Bond #29 for low pressure, #12 for high pressure.
 - b. Minnesota Mining and Mfg. Co. EC800.
 - c. Hardcast R 6350 tape and activator/adhesive.
 - d. United Sheet Metal R-5966 (N), Listing #1.
 - e. Borden Arabol E-3806 lagging adhesive plus 6 ounce canvas.
4. Approved factory made joints such as DUCTMATE SYSTEM may be used.

2.2 LOW PRESSURE DUCTS

- A. Gauges, reinforcement, joints, seams, sealing, fittings, supports and other details: SMACNA Low Pressure Duct Construction Standards (LPDS). Construction ducts not shown otherwise for 2 inches wg static pressure rating. Note that the maximum rating for snap lock construction (LPDS Section 2) is 1/2 inch wg, positive or negative.
- B. Sealing: Seal Class B (2" inch wg static), Class C (1 inch wg static) or Class D (1/2 inch wg static) in accordance with SMACNA LPDS Table 1-2.
- C. Casings and Plenums: Construct in accordance with SMACNA LPDS, Section 3, including curbs, access doors, pipe penetrations, eliminators and drain pans. Access doors shall be hollow metal, insulated with latches and door pulls, 20 inches wide by 48 - 54 inches high. Provide viewport in the door on the entering outdoor air side of heat recovery wheels and where otherwise shown.
- D. Volume Dampers: Single blade or opposed blade, multi-louver type as detailed in SMACNA Standards, figures 2-11 and 2-12. Provide end bearing for all dampers. Quadrant or other operator for externally insulated duct shall have stand-off mount so operation is clear of the insulation.
- E. Construct tees, bends and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air oil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

2.3 DUCT ACCESS DOOR, PANELS AND SECTIONS

- A. Provide access doors, sized and located for maintenance work, upstream where possible, in the following locations:
 1. For cleaning all ductwork, locate access doors at each change in duct direction.

2. At fire damper locations.

- B. Openings shall be as large as feasible in small ducts, 12-inch by 12-inch minimum where possible. Access sections in insulated ducts shall be double-wall, insulated. Transparent shatterproof covers are preferred for uninsulated ducts.

Ducts size under 16" - 2" smaller than duct size by 10" wide.

From 16" to 24"	14" X 14"
Over 24"	20" X 16"

2.4 FLEXIBLE CONNECTIONS

- A. Where duct connections are made to fans, air handling units, etc., and where indicated on plans, install a non-combustible flexible connection of 29 ounce neoprene coated fiberglass fabric approximately six inches wide. Burning characteristics shall conform to NPFA 90a. Securely fasten flexible connections to round ducts with stainless steel or zinc-coated iron draw bands with worm gear fastener. For rectangular connections, crimp fabric to sheet metal and fasten sheet metal to ducts by screws two inches on center. Fabric shall not be stressed other than by air pressure. Allow at least one inch slack to insure that no vibration is transmitted.
- B. Where ducts, fire dampers, frames or after filter frames of dissimilar metal are connected, provide a coupling consisting of flanges, neoprene gaskets, fabric and nuts and bolts.

2.5 SEISMIC RESTRAINT FOR DUCTWORK

- A. See Section 15070.
- B. Ductwork shall be supported and braced to resist all directional (transverse, longitudinal and vertical) forces equal to 10 percent of the weight of the duct system.

2.6 INSTRUMENT TEST FITTINGS

- A. Manufactured type with a minimum two inch length for insulated duct, and a minimum one inch length for duct not insulated. Test hole shall have a flat gasket for rectangular ducts and a concave gasket for round ducts at the base, and a screw cap to prevent air leakage.
- B. Provide instrument test holes at each duct or casing mounted temperature sensor or transmitter, and at entering and leaving side of each heating coil and cooling coil.

2.7 DUCT LINER

- A. Duct sizes shown on drawings for lined duct are inside dimensions after lining has been installed.
- B. Liner: ASTM C1071, Type I flexible, Manville Permacote Linacoustic or equal, 1-1/2" minimum thickness applied with mechanical fasteners and 100 percent coverage of adhesive in conformance with SMACNA Duct Liner Application Standard.

2.8 FIRE DAMPERS

- A. Shall be installed in all openings or ducts passing through floor blabs, in all two hour rated walls, as indicated on architectural plans, and in all other rated walls or ceilings as required and/or indicated on drawings.
- B. Each shall be furnished and installed in accordance with NFPA 90A latest edition and bear U.L. Label and shall conform to Bulletin #UL-555.
- C. Dampers shall be Ruskin #IBD2 vertical or horizontal Style B or Style C for round ducts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with provisions of Section, GENERAL PROVISIONS FOR MECHANICAL WORK, particularly regarding coordination with other trades and work in existing buildings.
- B. Fabricate and install ductwork and accessories in accordance with referenced SMACNA Standards:
 - 1. Fabricate ductwork based on field measurements of space available. Duct sizes on the drawings are clear inside dimensions which shall be altered by the contractor when approved by the Engineer, to other dimension producing the same air handling characteristics where necessary to avoid interferences and clearance difficulties.
 - 2. Provide duct transitions, offsets and connections to dampers, coils, and other equipment in accordance with LPDS, Figures 2-7 and 2-9. Provide streamliner, LPDS, Figure 2-8, when an obstruction cannot be avoided and must be taken in by a duct. Weld sheet metal in accordance with SMACNA Guidelines for Welding Sheet Metal. Repair galvanized areas with galvanizing repair compound.
 - 3. Construct casing eliminators and pipe penetrations in accordance with LPDS, Chapter 3. Design casing access doors to swing against air pressure so the pressure helps to maintain a tight seal.
- C. Install duct hangers and supports in accordance with SMACNA, LPDS, Chapter 5.
- D. Seal openings around duct penetrations of floors and fire rated partitions with fire stop material as required by NFPA 90A.
- E. Protection and Cleaning: Adequately protect equipment and materials against physical damage. Place equipment in first class operating condition, or return to source of supply for repair or replacement, as determined by Engineer. Protect equipment and ducts during construction against entry of foreign matter to the inside and clean both inside and outside before operation and painting. When new ducts are connected to existing ductwork, clean both new and existing ductwork by mopping and vacuum cleaning inside and outside before operation.

- F. Provide splitter or volume dampers as shown on plans or required to properly balance the air systems.

3.2 DUCT LEAKAGE TESTS AND REPAIR

- A. Low Pressure Ducts: Seal visible openings and seal air leaks audible at operating conditions.

END OF SECTION 15890

SECTION 15952 – ELECTRIC ELECTRONIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 - SCOPE

- A. This section describes the Control System for new equipment.

1.2 - DESCRIPTION

- A. Furnish and install, complete and ready for operation, an automatic temperature control system utilizing electric/electronic operation. The control system shall be complete with all necessary control devices and hardware including: Control wiring, thermostats, control valves, motor operators, relays, switches, transformers, etc., and all required components.

1.3 - WIRING

- A. All line voltage and low voltage control wiring shall be provided and installed by the temperature control contractor. All line voltage wiring to transformers for temperature control shall be by temperature control contractor.
- B. All exposed wiring by temperature control contractor shall be installed in conduit provided and installed by temperature control contractor. All wiring installed behind finished surfaces does not require conduit. All wiring shall comply with National, State and local electrical codes.

PART 2 - PRODUCTS

2.1 - TRANSFORMERS

- A. If necessary, provide 115V/24V transformers as required for low voltage controls. Mount in unitized cabinet.

2.2 - THERMOSTATS

- A. Thermostats shall be furnished with VAV system. See below.

2.3 – VAV SYSTEM

- A. Provide a stand-alone Orion VAV system. All components shall provide a complete VAV system. System shall include controllers, room sensors with setpoint adjustment and override, communicating boards, pressure independent zone dampers (see Schedule on Plans), bypass dampers and actuators, and all required accessories and wiring to provide a complete operable system. Install in strict accordance with manufacturer's instruction. Start-up by factory authorized technician.

PART 3 - EXECUTION

3.1 - INSTRUCTION AND ADJUSTMENT

- A. Upon completion of the project, the temperature control contractor shall:
1. Check, validate and calibrate where required, all controllers, controlled devices, valves, transmitters, auxiliary devices and relays, etc., provided under this section.
 2. Furnish three instruction manuals covering the function and operation of the control systems on the project for use by the Owner's operating personnel. A competent technician shall provide these manuals at the time of instruction.

END OF SECTION 15952

SECTION 15990 – TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere:

1. The General Conditions state that the Contract Documents are complementary.
2. Temporary facilities and controls are specified in Section 01500. Cooperate in ensuring adequate protection.
3. General material, equipment and workmanship standards are specified in Section 01600.
4. Sequence of Operation is specified in Section 15985.

B. Work Included:

1. Test all specified systems as shown on drawings and schedules, balance and adjust them as specified below.

1.2 QUALIFICATIONS

- A. Testing and balancing shall be performed by a member of either AABC or NEBB in accordance with the latest standards of its respective organizations.
- B. Agency shall provide proof of having successfully completed at least five projects of similar size and scope. Work by this agency shall be done under direct supervision of a qualified heating and ventilating engineer employed by agency.
- C. Submit air balance reports for approval noting any discrepancies which are greater than 5% from design conditions.

1.3 SUBMITTALS

- A. Submittal Requirements and Procedures are specified in Section 01300.
- B. Air Balance and Testing Agency shall perform test specified, compile test data, and submit four copies of complete test data to contractor for forwarding to engineer for evaluation and approval. Approved copies of report shall be bound in Operations and Maintenance Manual.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. All test equipment shall be accurately calibrated within 30 days of test and maintained in good working order.
- B. Test equipment shall be suitable for the service and range of the system being tested.

PART 3 - EXECUTION

3.01 AIR BALANCE

- A. Begin air balance and testing upon completion of air cooling, heating and exhaust systems including installation of all specialties and devices.
- B. Contractor shall put heating, ventilating and cooling systems and equipment into full operation and continue their operation during each working day of testing and balancing.
- C. Standards: Perform testing and balancing in complete accordance with the Associated Air Balance Council Standards, (AABC) for Field Measurement and Instructions, Form P1266, Volume 1 and National Environmental Balancing Bureau (NEBB). Record test data on AAVC standard forms or facsimile thereof.
- D. Testing Procedure: Air Balance and Testing Agency shall perform following tests and balance system in accordance with the following requirements: Perform test "a" through "d" at high and low speeds of multi-speed systems and single speed systems.
- E. Inspect duct system for tightness, if ducted systems leak badly, do not continue with air balance. Report findings to Engineer and begin testing again after contractor has repaired ducts or applied duct sealers.
- F. Test and adjust blower RPM to design requirements (check rotation).
- G. Test and record motor full load amperes and voltage.
- H. Make pitot tube traverse of main supply and obtain design cfm fans.
- I. Test and record system static pressures, suction, and discharge. Note whether filters are clean or dirty.
- J. Test and adjust system for design cfm air.
- K. Test and adjust system for design cfm outside air.
- L. Test and adjust each diffuser, register and grille to within 5% of design.

M. Controls:

1. Contractor shall check the operation of all controls to insure that they are all in working order.
2. Check the following controls:
 - High temperature limit shut off function and calibration.
 - Low temperature limit shut off function and calibration.

END OF SECTION 15990

SECTION 16010 – GENERAL PROVISIONS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents, as defined in the Division 1 - General Requirements of the Contract for construction, are complementary. Requirements contained in any of the documents apply to this section of Division 16 as if contained herein. The contractor is expected to have read the Contract Documents in their entirety and shall be governed thereby.

1.2 DESCRIPTION

- A. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division.
- B. The work described in this Division shall be governed by all the conditions of Division 1; "General Conditions" as well as all plans, specifications and all addenda issued during the bidding period.
- C. If any of the work under this Division is performed by a subcontractor, the Contractor, nevertheless, shall remain responsible for the proper integration of the work under this Division with the work under all other divisions of the specifications.
- D. Bidders shall familiarize themselves with all drawings on this project; Architectural, Structural, Mechanical and other trades as well as the Electrical, so as to avoid errors, omissions and misinterpretations. No compensation will be granted for such errors, omissions, and misinterpretations whether they are a result of failure to observe this precaution or not.
- E. The right is reserved to make reasonable changes in the location of outlets and equipment prior to installation, also to make minor changes or substitutions which do not increase the Contractor's cost, all without involving additional expense to the Owner.
- F. The right is reserved to make changes from the original specifications and drawings during Shop Drawing review, providing such changes do not increase the cost of the specified material. The Architect's decision on such changes shall be final.
- G. The following sections are also a part of this Division:

Section 16010 - General Provisions for Electrical Work
Section 16100 - Basic Materials and Methods

1.3 DEFINITIONS

- A. The following words or term contractions used for convenience throughout this specification are, unless specifically noted to the contrary, defined as follows:
1. "Contractor", as used herein, means the Prime Subcontractor responsible for the work of that specific section of Division 16.
 2. "Furnish" or "Provide": To supply, install and connect up complete and ready for safe and regular operation of particular work referred to unless specifically otherwise noted.
 3. "Regulating authorities" or "Authorities": Means all governmental, utility and insuring authorities having jurisdiction.
 4. "Install": To erect, mount and connect complete with related accessories.
 5. "Supply": To purchase, procure, acquire and deliver complete with related accessories.
 6. "Work": Labor, materials, equipment, apparatus, controls, accessories and other items required for proper and complete installation.
 7. "Wiring": Raceway, fittings, wire, boxes and related items.
 8. "Concealed": Means hidden from sight as embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.
 9. "Exposed": Not installed underground or "concealed" as defined above.
 10. "Similar " or "Equal": Equal in materials, weight, size, design quality and efficiency of specified product.
 11. "Conduit or Raceway System" means all fittings, outlet boxes, pull and junction boxes, double locknuts and bushings, hangers and other accessories related to such electrical piping.

1.4 WORK INCLUDED

- A. The work to be provided under this Division includes the furnishing of all labor, materials, supervision, supplies and equipment required or obviously necessary to install completely, ready for use, all electrical systems, equipment and associated items, included in this project as indicated on plans and described in specifications and subject to the terms and conditions of the contract, except as provided in Paragraph B below.
- B. Certain items of equipment which are furnished under other Divisions of the Specifications will be supplied complete with motors and control. Certain equipment shall be supplied under other Divisions (or by the Owner) which require electrical work, connections, etc. In general,

the Electrical Contract includes circuits, wiring, suitable disconnect devices, overload devices and connections of such items. Refer to subsequent sections of this Division and the Mechanical Division for details in each case.

1.5 RELATED WORK FURNISHED UNDER OTHER DIVISIONS

A. The following, and only the following items of labor and materials related to or incidental to the installation of the work, will be provided under separate Divisions of the Contract for construction.

1. Temporary facilities and controls. Cooperate in ensuring adequate protection.
2. Concrete work.
3. Finish painting.
4. Cutting, patching, chases and furred spaces.
5. Access doors and panels.

1.6 INTENT

- A. It is the intent of the drawings and specifications to call for finished work, tested and ready for operation.
- B. Any apparatus, appliance, material or work not shown on the drawings, but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed under their respective Division without additional expense to the Owner.
- C. Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the work as though they were hereinafter shown or specified.
- D. Work under each Section shall include giving written notice to the Architect/Engineer ten (10) business days prior to bid of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction and any necessary items of work omitted. In the absence of written notice, it is mutually agreed that work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

1.7 ACCURACY OF DATA

- A. The data indicated on the drawings in these specifications are as exact as could be secured, but their absolute accuracy is not guaranteed. Do not scale the drawings. Exact locations, distances, levels, and other conditions will be governed by the building. Use the drawings and specifications for guidance and secure the Architect's approval of all changes in location.

- B. Electrical drawings are symbolic and diagrammatic in nature and are intended to show only the general scheme work and equipment involved and only in a very general way, the approximate locations of outlets and equipment. Exact locations of outlets, fixtures, equipment, etc., pertinent dimensions, information as to Architectural and Structural features and similar data shall be taken from the latest prints of drawings specifically intended to show this information. Locations not indicated on such drawings nor obvious shall be obtained in the field from the Architect. Note that some details and locations may be shown on shop drawings, and supplemental drawings and sketches provided during construction. This Contractor is held responsible for the proper installation of the system according to the true intent and meaning of the drawings and specifications and in accordance with good practice.
- C. Circuits, where shown on electrical drawings, are so indicated primarily for the purpose of indicating the general circuit plan and do not necessarily indicate the exact location or routing of raceways unless specifically so indicated. Circuits shall be run to suit conditions, considering structural features, construction methods and good practice. Junction and pull boxes indicated on drawings are minimum requirements and shall be provided, additional junction and pull boxes shall be provided as necessary to suit job conditions and actual routing of circuits. Final routing of conduit runs may affect wire sizes. Adjust accordingly.

1.8 CODES AND ORDINANCES

- A. The Codes and Standards listed below apply to all electrical work. Where codes or standards are mentioned in these specifications, the latest edition or revision shall be followed:

- IES - Lighting Handbook
- NEMA - Standards
- ANSI C1 - National Electrical Code (NFPA 70)
- ANSI C50 - Rotating Electrical Machinery
- ANSI C51.1 - Construction and Guide for Selection,
Installation and Use of Electric Motors
- ANSI C52.1 - Motors and Generators (NEMA MG1)
- FIPS Publication #94 - Guideline on Electrical Power for ADP Installations

- B. The following National, State and local Codes shall apply:

- 2005 Connecticut State Building Code with 2013 Amendments
- 2003 Life Safety Code NFPA 101-91
- 2005 Connecticut State Fire Safety Code with 2009 Amendments
- 2011 National Electrical Code NFPA 70
- ADA-American with Disabilities Act
- Occupational Safety and Health Standards

- C. The following abbreviations are used within this Division of the specifications:

- IES - Illuminating Engineering Society
- NEC - National Electrical Code

ANSI - American National Standards Institute
ASTM - American Society for Testing and Materials
EPA - Environmental Protection Agency
IEEE - Institute of Electrical and Electronic Engineers
NEMA - National Electrical Manufacturers Association
NFPA - National Fire Protection Association
OSHA - Occupational Safety and Health Administration
UL - Underwriter's Laboratories

- D. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction, and with the requirements of all governmental departments having jurisdiction.
- E. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on drawings and/or specified.

1.9 PERMITS AND FEES

- A. The Electrical Contractor shall give all necessary notices, obtain all permits, pay all Governmental and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with his work. He shall file all necessary drawings, prepare all documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for his work and deliver a copy to the Engineer before request for acceptance and final payment for the work.
- B. The Contractor shall submit to the Architect, upon completion, a certificate of final inspection and approval from the proper authorities if such a certificate is normally supplied by these authorities. Such certificates, however, shall not relieve the Contractor or Subcontractor from responsibility for complete compliance with the contract, drawings and specifications.

1.10 COORDINATION WITH OTHER DIVISIONS

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other contractors, especially the General Contractor, with information as to openings, chases, equipment locations and panels required by other trades.
- B. The contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference. The Engineer shall make final decisions regarding the arrangement of work which cannot be agreed upon by the contractors.

- C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment.
- D. If the work under a Section is installed before coordinating with other Divisions or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.

1.11 CHANGES IN WORK

- A. Specified in Supplementary General Conditions.

1.12 RECORD DRAWINGS

- A. Specified in Supplementary General Conditions.

1.13 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the work, except as otherwise specified, shall be new and of first-class quality and shall be furnished, delivered, erected, connected and finished in every detail and so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of materials is given, a first-class standard article as accepted by the Engineer shall be furnished.
- B. All electrical materials and equipment provided shall be so approved and listed in the latest edition of the respective U.L. list and supplement lists.
- C. Specifications for a particular piece of equipment, device or material specifically indicated on the drawings by model number, type, series, or other means, shall take precedence over equipment or materials specified herein.
- D. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work, together with all skilled workmen, helpers, and labor required to unload, transfer, erect, connect up, adjust, start, operate and test each system.
- E. Unless otherwise specifically indicated on the drawings or in the specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- F. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a sub-standard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra charge to the Owner.

1.14 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Work under each Section shall include protecting the work and materials of all other Sections from damage by work or workmen and shall include making good all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until finally inspected, tested and accepted. Work and equipment shall be protected from water, dust and dirt, and against theft, injury or damage. Material and equipment received on site which is not immediately installed shall be carefully and securely stored. Open ends of work, including panels, shall be closed with temporary covers or plugs during construction to prevent entry of obstructing or other foreign material and unauthorized persons.
- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place, and connecting up completely of any equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures and shall include the cost of replacing any of the above equipment and fixtures which are missing or damaged by reason of mishandling or failure on the part of the Contractor to protect.

1.15 SHOP DRAWINGS

- A. The Contractor shall submit for review, detailed shop drawings of all equipment and materials specified. The Contractor shall review all shop drawings prior to submission to the Engineer for review. No material or equipment may be delivered to the job site or installed until the Contractor has in his possession, reviewed shop drawings for that particular material or equipment.
- B. Shop drawings shall be submitted as soon as practical and before any material or equipment is purchased. The Contractor shall submit for review, copies of all shop drawings to be incorporated in the Electrical Contract. Refer to the General Conditions and Supplementary General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.
- C. Where three manufacturers of a particular item of equipment or materials are listed, the Contractor shall use one of those listed with no substitute allowed.
- D. Where one manufacturer of a particular item of equipment or materials are listed, the Contractor shall use that listed with no substitute of alternate equipment or materials.
- E. The Contractor shall immediately, upon request, and without additional cost, present samples and test data of proposed items for review by the engineer.
- F. Shop drawings shall be submitted for all equipment including lamps and ballasts, and/or devices specified. Shop drawings shall include manufacturer's names, catalog numbers, cuts, diagrams, complete engineering performance, and other such descriptive data as may be required to identify and approve the equipment. No consideration will be given to a partial

shop drawing submittal. Equipment that is U.L. listed shall be indicated if for complete assembly or just for identified components.

- G. Where multiple quantities of types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.
- H. Failure of the Contractor to submit shop drawings in ample time for review shall not entitle him to an extension of contract time and no claim for extension by reason of such default will be allowed, nor shall it entitle him to purchase, furnish and/or install alternate equipment.
- I. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.
- J. Review of shop drawings shall not apply to quantity nor relieve the Contractor of his responsibility to comply with the intent of the drawings and specifications.
- K. Shop drawings shall be specific with items submitted for approval clearly identified in red ink. Data of general nature will not be accepted.

1.16 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the Engineer, or required by a manufacturer for start-up, a factory-trained service engineering representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service engineering representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service engineering representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer. All related cost shall be included in the contractor's bid price.

1.17 PRELIMINARY OPERATION

- A. Operate electrical systems with required supervision for at least two full days prior to substantial completion. Make necessary adjustments, and check proper operation.

1.18 TESTS PRIOR TO SUBSTANTIAL COMPLETION

- A. Test shall be attended by representatives of electrical subcontractors, equipped with instruments required to demonstrate proper functioning of systems, as specified. Demonstrate the following:
 - 1. Equipment installed and operating in accordance with manufacturer's specifications and instructions and with these specifications.
 - 2. Safety controls operating as specified.
 - 3. Motors equipped with proper overload protection and not operating under overload. Obtain ammeter readings.
 - 4. Instruments recording properly.
- B. Submit letters listing system tested, date, results, and description of fault corrections, if any.

1.19 GENERAL WIRING TESTS

- A. The test is to be done when all wiring is in place and identified, all splices made and fixture wires left at the outlets ready for immediate attachment of fixtures. All other splices of the system are to be made and laid into the outlet.
- B. Each system must test free from short circuits and have an insulation resistance of not less than 50 megohms (for systems 600 volts and below) where tested with a 500V DC potential at 70 deg. F. ambient temperature with a reasonably dry atmosphere between conductors and grounds. Insulation resistance shall be in accordance with N.E.C. requirements.
- C. All testing equipment necessary to satisfactorily conduct the above tests must be furnished by the Contractor without additional cost.

1.20 BASES AND SUPPORTS

- A. Unless otherwise specifically noted, the Electrical Contractor shall furnish all necessary supports, pads, bases and piers required for all equipment furnished under this Division.

1.21 SLEEVES, INSERTS, PITCH POCKETS AND ANCHOR BOLTS

- A. The Contractor shall provide, set in place, and be held responsible for the location of all sleeves, inserts, pitch pockets and anchor bolts required for his work before the floors and walls are built. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the electrical contractor's expense.

1.22 FIRE-STOPS AND SEALS

- A. Penetrations through fire-rated walls, ceilings or floors in which cables or conduits pass shall be filled solidly by a UL listed fire-stop material, classified for an hourly rating equal to the fire rating of the wall, ceiling or floor. Equal to 3M brand fire barrier CP25WB caulk.

- B. Sealing bushings shall be used on conduit and cable ends to effectively prevent the intrusion of water, a damp or corrosive atmosphere, hot or cold air, or dust.

1.23 CUTTING, DRILLING AND PATCHING

- A. All cutting, drilling and patching shall be performed under another Division of the specifications. The Electrical Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.

1.24 PAINTING

- A. All finish painting in completed areas shall be performed under another Division of the specifications.
- B. All materials shipped to the job site under this division, such as panels, plates, etc., shall have prime coat and standard manufacturer's finish, unless otherwise specified.
- C. The Contractor shall perform all painting in areas in accordance with the following:
 - 1. All concealed, non-insulated hangers, supports and other ferrous metal work, except that which is galvanized, shall be painted. Inaccessible conduits, hangers, supports and anchors and ducts shall be coated prior to installation.
 - 2. The manufacturer's nameplate data on equipment shall not be painted over.
 - 3. Damaged equipment shop coats shall be touched up in the field to match manufacturer's original finish.

1.25 TEMPORARY SERVICES

- A. The Contractor shall refer to the General Conditions and Temporary Facilities for a full description of the temporary services to be provided.

1.26 SCAFFOLDING, RIGGING AND HOISTING

- A. The Contractor shall include all scaffolding, rigging, hoisting and services necessary for the erection and delivery onto the premises of any equipment and apparatus furnished under this Division. Remove same from the premises when no longer required.

1.27 KEYS

- A. At the completion of the project, turn over for the Owner's use, two (2) sets of keys for all lockable type equipment.
- B. Provide identification tags for all keys prior to turning over.

1.28 FINAL CLEANING

- A. Upon completion of the work under this Division, Contractor shall leave premises free of dirt and debris and left over materials, tools, and equipment accumulated by him or his work. Oil or grease stains on floors or walls caused by the electrical contractor, shall be removed, and floors and walls shall be left clean.
- B. The Contractor shall thoroughly clean all equipment of all foreign substances inside and out before being placed in operation.
- C. Electrical equipment surfaces shall be wiped clean of oil, grease, stickers, taps, drippings and dirt. Repaint any equipment where finish is damaged or rusted.
- D. Nameplates and equipment designations shall be left clean and legible.

1.29 EQUIPMENT CLEARANCES

- A. Deliver equipment, knocked down if necessary, to place it in proper position.
- B. Install equipment with adequate clearances for maintenance and operation, both of the equipment and of adjacent equipment.
- C. Locate all equipment with adequate clearance as per all applicable articles in the National Electrical Code, O.S.H.A., and local authorities. No electrical equipment shall be installed without the proper clearance around equipment. Where the drawings are in conflict, the Contractor shall obtain written instructions from the Engineer before violation of any codes. Any equipment installed without written instructions from the Engineer shall be removed and relocated without additional expense to the Owner.

1.30 WATERPROOFING

- A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

1.31 ACCESS PANELS

- A. The General Contractor shall furnish and install access panels and doors as required for access to inaccessible pullboxes, junction boxes and other specialties.
- B. The Contractor shall coordinate the locations of access panels and doors with the General Contractor and other trades. Final locations shall be subject to the approval of the Architect.

1.32 ENVIRONMENTAL CONDITIONS

- A. All items of metal furnished or installed hereunder shall be adequately insulated or isolated from contact with other dissimilar metals or any materials which might adversely affect the same.
- B. Nails, rivets, screws and similar fastenings shall be wholly compatible with the materials for which they are being used and shall have the Engineer's approval before use. Items showing signs of rust or corrosion shall be replaced.

1.33 MANUFACTURER'S INSTRUCTIONS

- A. The Contractor is held responsible for installing all equipment in accordance with manufacturer's instructions or requirements for proper operation and maintenance.
- B. If such instructions or requirements conflict with the intent of the plans and specifications, the Contractor shall obtain written instructions from the engineer before violating the manufacturer's requirements.

1.34 OPERATING INSTRUCTIONS

- A. Provide services of factory engineers, representatives of other competent instructors who will give full instructions and demonstrations in the operation and care of each electrical system and each item of equipment.
- B. Coordinate instruction periods with the Owner. The Contractor shall give at least 48 hours notice to the Owner in advance of this period.
- C. The Contractor shall furnish for delivery to the Engineer, four (4) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instruction. Include listing of part numbers to assist Owner when he has to order replacement parts.
- D. The Contractor in the above-mentioned instructions shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- E. An authorized manufacturer's representative shall attest in writing that his equipment has been properly installed prior to startup. These letters will be bound into the operating and maintenance books.

1.35 ELECTRICAL SYSTEMS IDENTIFICATION

- A. Each disconnect switch, lighting panel and piece of apparatus furnished and installed under this Division shall be provided with a laminated plastic nameplate securely fastened with suitable adhesives or rivets. Equipment shall be numbered according to the Equipment

Schedules on the drawings. Directories indicating number, location and use of each circuit shall be located at each panel.

- B. See Section 16100 - Basic Materials and Methods.
- C. Provide on inside cover of panels, typed circuit breaker indicating each branch circuit, spare and space. Opposite each number, give the area or equipment which that circuit controls.

1.36 WARRANTY

- A. Submit written warranty or warranties covering work specified in division 16000. Warranty period shall be one year from the date of final acceptance of the project. Owner is to receive full use of equipment for period of warranty. Place copies in operating instructions.

1.37 GUARANTEE

- A. The Contractor shall guarantee, for a period of one year from formal acceptance of the project, that all electrical work done under this division of the specifications shall be free from defects in equipment, materials and workmanship. Should any defects occur during this guarantee period, the Contractor shall immediately repair/or replace all defective equipment, materials, and/or work without cost to the Owner. Guarantee shall include labor, parts, driving time to and from job site, etc.

1.38 SURVEYS AND MEASUREMENTS

- A. Before submitting his bid, the Contractor shall visit the site and shall become thoroughly familiar with all conditions under which his work will be installed as he will be responsible for any assumptions, omissions or errors he makes as a result of his failure to become familiar with the site and the contract documents.
- B. The Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the drawings and specifications, he shall notify the Architect and shall not proceed with that work until he has received instructions from the Architect.

END OF SECTION 16010

SECTION 16100 – BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. The General Conditions, Article 1.2.3, states that the Contract Documents are complementary.
- B. Temporary facilities and controls are specified in Section 01500. Cooperate in ensuring adequate protection.
- C. General material, equipment and workmanship standards are specified in Section 16010.
- D. General requirements for Electrical work are specified in Section 16010.

1.2 DESCRIPTION OF WORK

- A. Work of this section defines the materials and methods to be used in the erection and installation of the electrical systems. These provisions are in addition to the requirements included in other sections of the specifications.

1.3 SUBMITTALS

- A. Submit shop drawings and product data for products specified in this Section.

1.4 GENERAL REQUIREMENTS

- A. All materials and equipment provided under this Section shall be new, first grade, best of their respective kinds and in no way shall they be less than the quality and intent set forth under this section, and shall meet the requirements of all standards set up to govern the manufacture of electrical materials and comply with all applicable codes and standards.
- B. All equipment and materials shall be specification grade and bear Underwriter's (UL) Label.
- C. All materials, equipment and other items provided under this section shall be in accordance with the design criteria and parameters set forth in this Section of the specifications and/or accompanying drawings, unless modifications are allowed thereto by the Engineer.
- D. The operation, capacity or performance of any material, equipment, or other item which does not comply with the requirements of this section shall be held to be defective and shall be replaced and put in proper and acceptable working order at no additional cost, to the satisfaction of the Architect.
- E. Any approval of drawings, descriptive data or samples of such equipment, etc., shall not relieve the Contractor of his responsibility to turn over to the Owner, all materials, equipment, systems, etc., in perfect working order at the completion of the project.

- F. Replace damaged equipment, materials and other such items with similar new equipment, etc., as deemed necessary by the Engineer.
- G. Coordinate the procurement of equipment and materials to suit construction progress.

PART 2 - PRODUCTS

2.1 CONDUIT AND CONDUIT FITTINGS

- A. Conduit sizes shall be as indicated and where not indicated, sizes shall meet the NEC requirements for the number and size of conductors to be installed. Minimum size conduit shall be 3/4" unless otherwise noted.
- B. Conduit shall be installed in an approved manner. Hangers and fasteners shall be of the type appropriate in design and in dimensions for the particular application and shall be securely fastened in place. All joints shall be securely and tightly made. Elbows, offsets and bends shall be uniform and symmetrical; runs shall be straight and true. Install in a professional, expert and workman-like manner to provide a firm mechanical assembly with good electrical conductivity throughout.

Provide separate green equipment ground wiring in all conduit. Size as per N.E.C.

- C. Rigid galvanized steel conduit (RGS) - Conduit shall be hot-dipped galvanized rigid steel with chromate finish. All threads shall be hot-dipped galvanized after threading. Conduit shall be UL labeled and conform to the latest revision of the Federal Specifications WWC-581E and with ANSI Standard C80-1. Interior of the conduit shall be coated with a silicone, epoxy-ester-type lubricant for ease of pulling wires and cables. All bends shall be rigid galvanized steel conduit (RGS) with long radius curves. All couplings, connections, nipples and fittings shall be of high quality type specifically designed for the purpose.

Conduit manufactured by Triangle, Republic or National.

- D. Electrical Metallic Tubing (EMT) - Tubing shall be thin wall, hot-dipped galvanized steel with chromate finish. Conduit shall be UL labeled and conform to the latest revision of the Federal Specification WWC-563 and ANSI Standard C80.3. Interior of the tubing shall be coated with a silicone, epoxy-ester-type lubricant for ease of pulling wires and cables. All bends shall be electrical metallic tubing (EMT) with long radius curves. All couplings, connectors and fittings shall be of high quality type specifically designed for the purpose.

Conduit manufactured by Triangle, Republic or National.

- E. Flexible Metallic Conduit (FMC) - Conduit shall be constructed of heavy galvanized sheet metal strip, spirally-wound in interlocked construction. Conduit shall be UL labeled and conform to the latest revision of the Federal Specification WWC-566B. All connectors, couplings and fittings shall be of high quality type, specifically designed for the purpose.

Conduit manufactured by Triangle, American Flexible Conduit, or Electri-Flex.

- F. Liquid-Tight Flexible Conduit - Conduit shall be constructed of heavy galvanized sheet metal strip, spirally-wound interlocked construction with an extruded polyvinyl gray jacket. Conduit shall be UL labeled and conform to the application and environment in which it will be used. All connections, couplings and fittings shall be of high quality type specifically designed for the purpose.

Conduit manufactured by O/Z Gedney or Electri-Flex.

- G. Rigid Polyvinyl Chloride Conduit (PVC) – Rigid polyvinyl chloride conduit shall be Schedule 40, 90 degrees C., U.L. rated. All PVC conduit and fittings shall be solvent welded. Manufactured by Carlon, Electri-Flex or Plastiline.

2.2 FITTINGS

- A. Conduit bodies for rigid galvanized steel conduit (RGS) shall be malleable iron-zinc plated with tapered threaded hubs and gasketed aluminum cover.
- B. Conduit bodies for electrical metallic tubing (EMT) shall be cast aluminum-aluminum enamel finish with set screw hubs and aluminum cover.
- C. Insulating bushings shall be high impact thermosetting phenolic with a 150 deg. C. UL temperature rating.
- D. Insulated grounding bushings shall be malleable iron zinc plated with molded on phenolic insulation and lay-in grounding lug.
- E. Conduit locknuts shall be heavy nut stock steel-zinc plated.
- F. Offset nipples shall be malleable iron zinc plated with rigid conduit threading and 3/4" offset.
- G. Connectors and couplings for electrical metallic tubing (EMT) shall be heavy steel-zinc plated with pre-set/pre-shaked set screws.
- H. Conduit straps shall be snap-type, double ribbed steel-zinc plated.
- I. Flexible metallic conduit connectors shall be malleable iron-zinc plated male hub threads with locknut.
- J. Conduit fittings shall be manufactured by O-Z Gedney, Crouse-Hinds or Appleton.

2.3 SUPPORT SYSTEMS

- A. Support channels shall be roll-formed 12 or 14 gauge steel - solid base or bolt hole base - hot dip galvanized finish. Complete with angle fittings, spring nuts, conduit supports, 3/8" threaded rods, etc., with plated finishes.
- B. Manufactured by Unistrut, Kindorf or B-Line Systems.

2.4 CONDUCTORS

- A. Conductors for building wiring shall be 98% conductivity, annealed copper with 600 volt insulation.
- B. Conductors sizes shall be as indicated on the drawings. If not indicated, the sizes of power and lighting conductors shall not be less than size No. 12 AWG, 90 degree C. rated.
- C. Conductors shall be Type THWN/THHN moisture and heat resistant thermoplastic, solid single conductor for No. 10 and smaller and Type THW or THWN/THHN moisture and heat resistant thermoplastic, stranded for No. 8 and larger. Insulation shall be rated 90 deg. C. All conductors shall conform to the requirements of the National Electrical Code. Color coded shall be per N.E.C.
- D. Wire shall be delivered to the site of the project in original packaging, or on factory reels, and fully identified with tags or labels indicating the manufacturer, insulation type, voltage rating, and wire size shall be clearly and permanently imprinted throughout the length of each conductor. Multi-conductor cables shall also identify the number of insulated conductors on the outer surface.
- E. Conductor ampacities, ambient temperatures and insulation shall be in compliance with the National Electrical Code.
- F. Conductors shall be as manufactured by Triangle PWC, Essex, General Cable, Southwire or American Insulated Wire.
- G. Special systems conductors shall be as specified or as required for particular system.

2.5 METAL CLAD CABLE

- A. Metal clad cable, Type MC, shall be of interlocking galvanized steel armor construction. Color coded thermoplastic/nylon. Insulation THHN, 90 deg. C., 600 volts, copper conductors and internal equipment copper ground conductor. Marker tape and cable tape over conductors. Conductor sizes shall be as indicated on the drawings, or shall be per N.E.C. if final length or actual run requires a greater size. If not indicated, the sizes of power and lighting conductors shall not be less than size No. 12 AWG. Manufactured by American Flexible Conduit, Triangle or General. Connectors by O-Z Gedney, Appleton or Thomas-Betts. Provide anti-short bushings (red head) under the armor jacket at terminations.
- B. Armored cable, Type "AC" will not be permitted for this project.

2.6 SAFETY SWITCHES

- A. Safety or disconnect switches shall be motor rated, metal enclosed, interlocking, cartridge fused, general duty and heavy duty type, with appropriate ampere and voltage ratings. Switches utilized as motor disconnects shall be unfused.
- B. Quick-make, quick-break mechanisms.
- C. Solid neutral.
- D. U.L. listed.
- E. Switches shall have proper type metal enclosures; standard, weatherproof, dustproof, etc., to suit their specific locations.
- F. Manufactured by: General Electric, Square "D" or Siemens.
- G. Switches shall be securely mounted in acceptance with the N.E.C. The Contractor shall provide all disconnects and mounting materials.

2.7 FUSES

- A. Fuses shall not be installed until equipment is ready to be energized. This measure prevents fuse damage during shipment of the equipment from the manufacturer to the job site or from water that may contact the fuse before the equipment is installed. All fuses shall be of the same manufacturer.
- B. Individual motor circuits shall be protected by BUSSMANN Fusetron Low-Peak or Dual-Element Fuses (250V). The fuses shall be installed in ratings approximately 125% of motor full load current. Equals: Shawmut or Little Fuse.

2.8 JUNCTION BOXES, PULL BOXES AND WIREWAYS

- A. Junction boxes, pullboxes, and wireways shall be of proper type and sizes as required. Boxes shall be U.L. listed.
- B. Junction boxes and pullboxes shall be sheet steel of riveted or welded construction, reinforced as necessary for rigidity and with flanges to receive covers. Covers shall be flat of the same material as the box and fastened to the box with machine screws. Box shall be furnished with knock-outs and finished with a rust-inhibiting phosphatizing coating and dark gray baked enamel finish inside and out. Boxes less than 18" in their greatest dimension shall be of #14 gauge metal. Boxes larger than 18" and less than 30" shall be #12 gauge metal. Boxes larger than 30" in their greatest dimensions shall be #10 gauge metal.

- C. Wireways shall be constructed in accordance with UL 870 and be U.L. listed. Wireway shall be sheet metal, furnished with knock-outs and finished with a rust-inhibiting phosphatizing coating and dark gray baked enamel finish inside and outside. Complete with hinged cover system captivated fasteners for holding in closed position, end covers, angle fittings, etc. Wireways 4" to 6" square shall be of #16 gauge metal. Wireways 8" to 12" square shall be of #14 gauge metal. Minimum size shall be 4" X 4".
- D. Junction boxes, pullboxes and wireways shall be as manufactured by Hoffman Engineering Co., Lee Products, Square "D", Barber Electric Manufacturing or ASCO.
- E. Outdoor junction boxes shall be cast aluminum type with bossed, drilled and tapped for conduit entrance, watertight screw down cast aluminum cover, neoprene gasket, stainless steel cover screws. U.L. listed NEMA Type 4, O-Z/Gedney, Appleton or Killark.

2.9 OUTLET BOXES

- A. Outlet boxes shall be flush or surface mounted and of proper type and size as required for the particular application. Size and type dictated by the number of devices, number of conductors and wiring method utilized. Boxes shall be adequate size for the installation of conductors without excessive bending or crimping of the conductors and damaging of conductor insulation.
- B. Outlet boxes shall be secured firmly in place to the building structure and set true and square. Provide suitable means to support outlet box to take the weight of the lighting fixture or device. Flush outlet boxes or box extension rings shall be set flush to the finished wall or ceiling.
- C. Switch, receptacle and device outlet boxes for flush mounting in masonry or concrete walls with concealed wiring, the boxes shall be of galvanized, one-piece design, tile type, 2-1/2 inches deep.
- D. Switch, receptacle and device outlet boxes for flush mounting in hollow drywalls with concealed wiring, the boxes shall be four (4") inches square by 1-1/2 inches deep, galvanized, with plaster extension ring for the device to be mounted in box. Plaster extension rings shall not be less than 1/2 inch deep. Three or more gang outlet boxes shall be galvanized gang boxes, 1-5/8 inches deep with gang box plaster extension ring not less than 1/2 inch deep.
- E. No "through-wall" boxes shall be permitted to be installed.
- F. Provide proper size knockouts for the system used and all unused knockouts shall remain closed. Boxes shall be provided with proper covers.
- G. Outlet boxes shall be galvanized steel equal to Steel City, National, Raco or Appleton.
- H. Switch, receptacle, device and fixture outlet boxes where conduit is exposed shall be four (4") inches square by 1-1/2 inches deep with Mulbury covers to match.
- I. Junction and outlet boxes where exposed to weather and wet locations, shall be cast aluminum type with threaded hubs, watertight, screw-on aluminum covers and gaskets to match. Manufactured by O-Z/Gedney, Type FS and FD, Killark or Appleton.

2.10 BACKBOARDS

- A. Backboards shall be fire retardant, Hickson Co. (DRI-CON) 3/4 inch type AC plywood of sufficient size for mounting of specified equipment. Paint both sides with two (2) coats of fire-proof gray enamel paint. Provide support channel behind board for air circulation between equipment board and structure that boards are fastened to. Lag channel to wall.

2.11 CABLE TIES

- A. Cable ties shall be fabricated of one-piece Halar (plenum rated) with no metal parts. Burndy, T&B, Panduit or Blackburn.

2.12 LIGHT SWITCHES AND RECEPTACLES

- A. Light switches and receptacles shall be specification grade, back and side wired with grounding screw. Switches and receptacles shall be U.L. labeled.
- B. Light switches and receptacles specified below are based on Pass and Seymour manufacture.
- C. Light Switches: Ivory color.

Single Pole Toggle Switch, 20A @ 120-277V:	CS20AC1-W
Three-Way Toggle Switch, 20A @ 120-277V	CS20AC3-W
Single Pole Pilot Toggle Switch, 20A @ 120-277V	PS20AC1-RPL

- D. Receptacles: Ivory color.

Duplex Receptacle	PS5362-W
Duplex Receptacle – GFI	2095-W
Duplex Receptacle – IG	IG6300 – Orange
Single Clock Receptacle	Leviton #5361-CH

2.13 PLATES

- A. Wall plates for switches, receptacles and blanks shall be smooth thermoplastic, ivory. Manufactured by Pass and Seymour, Trademaster series.
- B. Wall plates for switches and receptacles on exposed conduit boxes shall be galvanized and zinc-coated with round edges, manufactured by Mulbury, Steel City or RACO.
- C. Weather-proof outlet cover devices shall be die-cast aluminum with spring-loaded hinged covers and neoprene gasket, manufactured by Hubbell #WP26 series. Equals: Mulbury or Bell.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall endeavor to lay out and perform his work in such a manner so as to cause no delay in the construction work by other trades.
- B. The Contractor shall verify all measurements and shall be held responsible for the correctness of same. No allowance will be made for difference between actual measurements and those shown on the drawings.
- C. All work shall be installed in such a readily accessible manner for maintenance, repair and operation. Deviations from the drawings must be approved by the Engineer.
- D. The Contractor shall coordinate his work with other trades involved so that exact locations may be obtained for all switches, outlets, apparatus, appliances and wiring.
- E. Where ductwork, piping, radiation, etc., interfere with the exact location for outlets shown on the drawings, the Contractor shall move the outlets where directed by the Engineer without charge to the Owner.
- F. The location of switches, outlets, apparatus, and equipment are approximate only and the runs of feeders, mains and branches are not necessarily to be made exactly as shown on the drawings. The exact locations of such work shall be determined after full consideration has been given to work of other trades and without changes in the design of the systems. The entire installation shall conform to the latest Edition of the NEC and to state and local inspectors.

3.2 RACEWAYS

- A. Where practical, conceal wiring in walls, ceilings or floors. In finished areas, surface wiring will only be allowed if there is no practical way of concealing the work. Where practical, install exposed conduit on the reverse side of finished walls in storage rooms, unfinished spaces, etc., and poke through wall into back of new flush outlet box. The use and location of surface raceways shall be approved by the Architect and Engineer.
- B. All of the conductors in this installation, other than cords, shall be run in conduits.
- C. It is intended that complete raceways or enclosures be provided for all circuiting or devices throughout the extent of all the systems specified.
- D. Install copper green insulated grounding conductor in all metallic and non-metallic conduits and raceways.
- E. Wiring in unfinished rooms shall be installed exposed using EMT or RGS conduit, or as required.
- F. Minimum size conduit shall be 3/4 inch nominal trade size.

- G. Rigid galvanized steel conduit (RGS) shall be used for wiring in the following locations:
- Below concrete slabs on grade.
 - Exposed to moisture and mechanical injury.
 - Within concrete slabs - 3/4" maximum.
 - Sweeps through concrete slab
- H. Electrical metallic tubing (EMT) shall be used for concealed and exposed wiring as follows:
- Lighting, receptacle and power branch wiring.
 - Equipment feeders.
 - Panel feeders.
 - Fire alarm system.
 - Power and Control Wiring
- I. Electrical metallic tubing (EMT) may be used only in dry locations and where not exposed to mechanical injury. In no case shall EMT be installed less than 18" above the floor, nor in or on the floors.
- J. Branch circuit wiring for switches, receptacles, devices and lighting in drywall construction and above hung ceilings may be installed in metal clad cable "MC" where permitted by the NEC. Wire sizes #10 AWG or smaller. Cable shall be installed as per NEC Article 333 and 334. Cable shall be supported from structure 4' feet O.C. with nylon cable ties. Provide appropriate grommets for horizontal runs in metal stud partitions. Cable shall not lay on ceiling structure or tiles. Provide anti-short bushings (red head) under armor jacket at terminations.
- K. Flexible metallic conduit shall be utilized for the final connection of motors. Provide anti-short bushings (red head) under armor jacket at terminations. Where exposed to moisture and water, flexible metallic conduit shall be liquid-tight. The length of the flexible connection utilized shall be kept at a minimum, not to exceed four (4) feet.
- L. Conduit, where run under the ground floor slab, shall be installed at least 3" below the underfill.
- M. Conduits installed exposed shall be placed at right angles to or parallel with the building walls. Where changes in direction are necessary, threaded fittings, elbows or junction boxes shall be employed. Not more than the equivalent of four 90-degree bends will be permitted in any run. Where more bends would be required, a pull box shall be installed. Pull boxes shall also be used where required by Code or by the local utility company.
- N. Conduit nipples and conduit with running threads shall not be used. Approved threaded couplings shall be used.
- O. All bends shall be the long radius type, manufactured or machine-made without kinks, flattening, or crushing. Conduit ends shall be square cut and reamed to remove burrs.
- P. Swab out and make dry all conduit. Cap all conduits until conductors are installed. Do not install wire in conduit or cabling until the area is under roof.

- Q. A minimum of six (6") inch clearance shall be maintained between conduit and piping. A minimum of twelve (12") inch clearance shall be maintained between conduit and heat sources such as flush or heating appliances.
- R. Provide nylon pull rope in all empty conduits.
- S. All conduits shall be supported using cadmium plated conduit straps and hangers, steel channel rack system with conduit straps and threaded rods.

3.3 WIRING

- A. Provide wiring to all outlets, equipment apparatus and other specialties provided under this Division that which is furnished or provided under another Division of these specifications or by the Owner.
- B. The term "wiring" shall be considered to be comprised of the conduit, conductors, connections, etc.
- C. All wiring on drawings is sized for Type THWN/THHN, 90°C. copper conductors unless otherwise noted on the drawings.
- D. The entire wiring system shall be grounded.
- E. Minimum size wire shall be #12 unless otherwise indicated. All conductors shall be soft-annealed copper. All wiring shall be color coded.
- F. Do not deviate from the circuit-outlet or circuit-fixture groupings denoted on the drawings.
- G. Neutrals are not to be combined or have a common neutral.
- H. Wiring in outlet boxes, junction boxes, cabinets, panels or equipment shall have a minimum of eight (8") inches length leads for connecting wiring devices to make up circuit splices.
- I. Care shall be exercised in pulling conductors into raceways so as not to injure the insulation. Cable pulling lubricant shall be used to assist in pulling #4 or larger conductors. The lubricant shall be equal to Aqua-Gel II as manufactured by Ideal. The lubricant shall be non-conductive, non-flammable, non-combustible and non-staining, and compatible with all cable insulation types.
- J. Do not connect lighting, convenience outlets, motors or any combination thereof on the same circuit unless otherwise directed.
- K. Conductors within panelboards, junction boxes, troughs and other equipment where concentrations of conductors are enclosed shall be neatly arranged and tied with approved cable ties.
- L. In the event oversized conductors are installed to overcome voltage drop and the conductors do not fit properly into the distribution or utilization equipment, provide increased leg size on the

equipment or a suitable junction box adjacent to the equipment for change in conductor sizes. The reduced conductor size from the junction box to the equipment shall be as large as possible to install, but in no way shall its current-carrying be less than that required by the equipment.

- M. Before installing wiring for equipment, verify locations and check approved shop drawings and/or associated data for wiring requirements. From this information, provide necessary wiring. Wiring for equipment not described in this section of the specifications or indicated on the drawings, but necessary for the proper operation of the equipment, shall be provided by this contractor.
- N. The mounting of equipment, whether provided under this Section or furnished and/or provided under other Sections of the specifications, generally done by the contractor, shall be provided by this contractor.
- O. Provide switches with thermal protection strips for fractional horsepower motors which do not have inherent thermal protection.
- P. Provide safety switches or disconnect devices where required by Code, unless such safety switches or devices are furnished as part of the equipment.
- Q. Equipment provided under this Section of the specifications or furnished and/or provided under other sections of the specifications requiring portable cords and plugs shall be provided by the contractor. Cords and plugs shall be of the multi-conductor type with one conductor utilized as an equipment ground. Cords, plugs and receptacles shall suit the equipment's requirements.
- R. All equipment, apparatus and other specialties shall be so arranged as to function satisfactorily at the project utilization voltages.
- S. Circuits shall be so connected to the panelboards that the total load is distributed as nearly as possible, equally between each line and neutral. 10% will be considered a reasonable and allowable unbalance. Branch circuits shall be balanced on their own panelboards, and feeder loads shall be, in turn, balanced on the main switchboard.
- T. Observe notes on drawings and instructions under specific items in specifications. All wiring shall be so installed as to permit removal and replacement of the conductors without damage to the construction or finish of the building.

3.4 SPLICES

- A. Splicing shall be done in accessible outlet and junction boxes only.
- B. Splicing shall be done with approved insulated or non-insulated connectors of appropriate types and current-carrying capacity. Non-insulated connectors shall be wrapped with approved insulating tape to the thickness of the insulation of the conductors being spliced. Electrical tape shall be 3M Super 33 or Super 88 Scotch Vinyl, flame-retardant, cold and weather-resistant.
- C. Splices for conductors, sizes #10 AWG or smaller, shall be made with U.I. listed spring-type connectors of appropriate current carrying capacity. Equal to 3M Scotchlok, Buchanan or T&B.

Splices for stranded conductors, sizes #10 AWG or smaller shall be made with UL listed crimp-type. Equal to 3M Scotchlok, Buchanan or T&B.

- D. Splices, taps and terminals for conductors #8 AWG and larger shall be made with UL listed bolted pressure connectors of bronze or copper construction, of appropriate current carrying capacity. Equal to O-Z/Gedney, Burndy or Blackburn.
- E. Connection from feeders to panelboards and other heavy equipment shall be made with lugs equal to O-Z/Gedney type "SL" series.
- F. No splices shall be permitted in feeders.
- G. No splices shall be pulled into conduit.

3.5 CONDUCTOR IDENTIFICATION

- A. Conductors #6 AWG and larger shall have color-coded insulation.
- B. Conductors #4 AWG and smaller shall be identified with tapes applied near the ends of the conductors.
- A. Feeders and branch circuit conductors shall be identified for phase rotation.

120/240V/1PH

Phase A	Black
Phase B	Red
Neutral	White
Grounding	Green

White shall be used only for neutrals. Green shall be used only for equipment grounds and bonds.

- D. All feeders, mains and branch circuit conductors shall be tagged at both ends with wire markers in all panels, motor controls, junction boxes, outlet boxes and device boxes.
- E. Use plastic-coated wire markers of the self-adhesive wrap-around type with permanent factory printed numbers, letters and symbols.
- F. Wire markers shall be securely attached at both ends, identifying panel and circuit breaker number.
- G. All conductors shall be permanently tagged at time of installation. Labels shall be equal to T&B, Panduit or Ideal.
- H. All special systems conductors, cables, etc., shall be tagged at both ends with wire tags in all panels, junction boxes and devices. Identification tags shall be equal to T&B "Ty-Rap" white nylon strips with broad marking surface. Marking shall be made with marking pen specifically made for writing on markers.

- I. Provide identification color for special systems conductors. Any combination of color may be selected. Exclude colors utilized for phase, neutral, and grounding conductors unless the same are part of, or used in combination with the particular system.

3.6 NAMEPLATES

- A. The Contractor shall furnish and install nameplates for all electrical equipment, identifying items by name, function and/or control.
- B. Identifying nameplates shall be laminated, plastic type, consisting of two white plastic sheets with one black plastic sheet bonded to and between the two outer black sheets and having the letters engraved in one black to the depth of the white plastic. Nameplates shall not be smaller than 1-1/2" X 3" with characters not less than 1/4". Fasten nameplates to equipment with suitable adhesives.
- C. Equipment and items to be identified and content of identification shall be as follows:
 1. Service and Metering Equipment
 - A. Main service switch.
 - B. Panels
 - C. Disconnect switches.

3.7 MOUNTING OF EQUIPMENT

- A. Provide mounting means for properly supporting all equipment provided under this Section or furnished under other sections of the specifications.
- B. Mounting means may consist of angle iron, channel iron, flat bar, pipe, unistrut, or plywood structures sized or constructed as required for the particular application or as indicated on the drawings.
- C. For hollow masonry, lath and sheet rock construction, toggle or molly bolt fastening shall be used. For structural iron or steel, use machine bolts. For solid masonry or concrete, use metallic expansion shields and machine bolts or screws. For wood and materials of similar fibrous nature, lag screws or bolts shall be employed. Screws with wooden plugs shall not ever be accepted on any of the work. Utilize approved support clips for all conductors which are not required to be run in conduit or raceways.
- D. Horizontal runs of conduit and raceways which are not installed concealed, or run in and supported by structural members, shall be supported at interval as required for a movement and sag-free installation.
- E. Utilize clevis-type hangers with round steel rods for supporting conduit. Rods shall be fastened to overhead structure with clamps, inserts or other approved structural compatible fittings.

- F. Individual conduits, especially large conduits, shall be supported by means of adjustable malleable hangers of approved design placed not more than 8'-0" on center.
- G. Parallel groups of conduit shall be supported by means of horizontal angle irons or channel systems, equal to unistrut, below the conduit with vertical hangers rods at both ends. Individual conduits shall be held in place by single-hold malleable clips.
- H. Supports for conduits or raceways on concrete masonry walls may be attached to walls with all metal expansion shields. Explosive-type inserts will not be allowed.
- I. All hangers, clips and accessories for supporting conduit shall be UL listed.
- J. Three-quarter-inch plywood backboard shall be used for mounting all surface-mounted disconnect switches, starters and other equipment. Backboards shall be given two (2) coats of fire retardant gray paint on all sides before installation.
- K. Exit signs, emergency lighting heads, smoke detectors, heat detectors, lighting fixtures, etc., shall be supported from building structure. Do not support from ceiling pad.
- L. Manual motor switches and other thermal protection devices shall not be mounted where subjected to abnormal ambient temperatures, such as in roof fan enclosures, near ranges or other heat producing equipment. Manual motor switches shall be mounted in separate boxes, not ganged together, in order to avoid mutual heat transfer.

3.8 GROUNDING

- A. All electrical work shall be grounded and bonded in full conformance with the National Electrical Code and Local requirements.
- B. All electrical equipment, service entrance, panelboard enclosures, motor frames, safety switches, motor controllers, metal enclosures, electrical device enclosures and all other equipment shall be made to form a continuous conducting, ground path of low impedance for ground fault circuits and operation of the circuit protective devices within each circuit.
- C. In all metallic and non-metallic electrical conduits and raceways, a green grounding wire shall be installed. Size of grounding wire shall be according to N.E.C. Minimum size grounding wire shall be #12 A.W.G.
- D. The grounding electrode conductors shall be one continuous length without splices. Equipment grounding conductors shall be solid or stranded copper conductors with green insulation or tape. All grounding conductors shall be installed in conduit and protected from physical damage. All grounding conductors shall be sized in accordance with the NEC. Provide grounding conductor in all conduits.
- E. Ground connections with the grounding conductors shall be made at each outlet box, lighting fixture, motor and other equipment components by means of a positively secured grounding clamp, screw or clip. Connections to grounding rods, other grounding electrode conductors shall

be made with Cadweld type, exothermic weld process unless otherwise noted. Connections to pipes shall be made with approved bronze or brass clamps.

- F. Bonding shall be provided to assure electrical continuity and the capacity to safely conduct any fault current likely to be corrosion-resistant material.
- G. The entire wiring system shall be tested for grounds in accordance with the requirements of the National Electrical Code.
- H. All devices (switches, receptacles, etc.), shall be grounded to conduit system with six (6) inch solid copper #12 AWG insulated wire (green) connected to ground screw on device and fastened to backbox with 10-32 X 3/8" slotted hexagon head washer face ground screw with green dye finish.

3.9 SAFETY SWITCHES

- A. Each motor, motor controller and other hardwired piece of electrical equipment shall have a safety switch which is in sight of the equipment and capable of disconnecting the equipment from the circuit. Controllers or starters which have an integral disconnect switch, as in the case of combination starter/disconnect units, are not required to have a separate disconnect means. Motors or other equipment which have remove mounted controllers shall have a separate safety switch as close as possible and within sight of the motor or equipment service. Where more than one motor is connected to a single-branch feeder, each motor shall have a disconnect switch even if within sight of the feeder branch breaker.
- B. The Contractor shall furnish and install disconnect switches for motors and/or power equipment to meet applicable code requirements.

3.10 LIGHT SWITCHES AND RECEPTACLES

- A. See the Electrical Drawings for mounting heights. Locations of all light switches, and electrical outlets indicated on drawings are approximate only. Prior to installation, exact location shall be determined after all pertinent drawings have been reviewed.
- B. Install all local lighting switches at lock side of door, approximately twelve (12") inches from door jamb, unless otherwise indicated and 48" A.F.F. to height of center line of box.
- C. Multiple switches shown at one location shall be installed ganged together under one wall plate. Switches and dimmers shall be arranged in an order appropriate to the locations of lighting fixtures being controlled.
- D. Unused outlets shall be provided with blank plates and match device plates within room.
- E. Install wall switches 48 inches above floor, unless otherwise noted. Off position down.
- F. Install convenience receptacles 18" inches above floor, 6 inches above backsplash unless otherwise noted, grounding pole on top.

- G. Install devices and wall plates flush and level.

END OF SECTION 16100