

00 01 01
Project Manual and Specifications



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

12/03/2018

City of Portland Maine Public Works Department

Sanitation Office / Crew Space

109 District Road
Portland, ME

Project Manual

Winton Scott Architects
5 Milk Street
Portland, Maine 04101

September 5, 2018

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SECTION 01 31 00

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 01 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. General project coordination procedures.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Information (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 01 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 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.



3. Drawing number and detail references, as appropriate, covered by subcontract.

B. 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, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

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1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction 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 to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

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.



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1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 REQUESTS FOR INFORMATION (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 either of the form(s) specified.
 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect and Construction Manager.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. 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.
 12. Contractor's signature.
 13. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. Hard-Copy RFIs: Form at end of this Section.
 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 seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.



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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 01 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 weekly. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect and Construction Manager.
 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.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- 1.7 PROJECT MEETINGS
- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: General progress items and discussions will be recorded by the Architect and distributed.



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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, Construction Manager, 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. Maine State Housing Authority Green Standards requirements.
 - l. Construction waste management.
 - m. Construction indoor air quality.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for moisture and mold control.
 - u. Procedures for disruptions and shutdowns.
 - v. Construction waste management and recycling.
 - w. Parking availability.
 - x. Office, work, and storage areas.
 - y. Equipment deliveries and priorities.
 - z. First aid.
 - aa. Security.
 - bb. Progress cleaning.
3. Minutes: The Architect will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.



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2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Construction Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, Construction Manager, 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) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
 - 19) Maine State Housing Authority Green Standards submittals and requirements.
 - 20) Construction waste management.
 - 21) Construction indoor air quality.
3. Minutes: Construction Manager will record and distribute to Architect the meeting minutes.
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.
- E. Project Closeout Conference: Construction Manager will schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.



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3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing sustainable design documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: 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 the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined 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.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.



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- 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) Change Orders.
3. Reporting: Record meeting results and distribute copies to Architect and everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00



REQUEST FOR INFORMATION

Project: _____	R.F.I. Number: _____
_____	From: _____
To: _____	Date: _____
_____	A/E Project Number: _____
Re: _____	Contract For: _____

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Specification Section:	Paragraph:	Drawings Reference:	Detail:
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Request:

Signed by:

Response:

___ Attachments

Response from:	To:	Date Rec'd	Date Ret'd
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Signed by:

Copies to:



SECTION 01 32 00

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. This 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 include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 01 Section "Quality Requirements" 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 activities are activities on the critical path. They 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. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- C. Event: The starting or ending point of an activity.



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- D. Float: The measure of leeway in starting and completing an activity.
- E. Major Area: A story of construction, a separate building, or a similar significant construction element.
- F. Milestone: A key or critical point in time for reference or measurement.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Two paper copies.
- B. Start-up construction schedule.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- D. Daily Construction Reports: Submit at monthly intervals.
- E. Material Location Reports: Submit at monthly intervals.
- F. Field Condition Reports: Submit at time of discovery of differing conditions.
- G. Special Reports: Submit at time of unusual event.
- H. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including work stages, area separations and milestones.
 - 4. Review time required for review of submittals and resubmittals.
 - 5. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 6. Review time required for completion and startup procedures.
 - 7. Review and finalize list of construction activities to be included in schedule.
 - 8. Review submittal requirements and procedures.
 - 9. Review procedures for updating schedule.



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1.6 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, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties 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 commencement of the Work 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.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 3. Startup and Testing Time: Include not less than 5 days for startup and testing.
 - 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 5. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.



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- f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
- a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
3. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
- 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
- 2.2 START-UP CONSTRUCTION SCHEDULE
- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.
- 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 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.



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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 30 days of date established for commencement of the Work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was 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 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 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 monthly 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. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.



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- C. Site Condition Reports: Immediately on discovery of a difference between site 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.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Architect 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 monthly intervals, review schedule for 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.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect 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 01 32 00



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SECTION 01 33 00

SUBMITTAL PROCEDURES

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 requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.



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1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals. Contact Architect for information.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.



- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- a. Sitework submittals.
- b. Commercial equipment submittals.
- c. Structural submittals.
- d. Mechanical submittals.
- e. Electrical submittals.
- f. Data & Communications Systems submittals.
5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
6. Submittals with Color Selections: Deliver to Architect a list of submittals required for the exterior color package and a list required for the interior color package. The Architect needs to coordinate the colors of all exterior and interior items and will hold submittals with color selections until all materials in the exterior color package have been received. Allow 2 weeks after the last item has been submitted for return of exterior color selections. The Architect will hold submittals with color selections until all materials in the interior color package have been received. Allow 3 weeks after the last item has been submitted for return of interior color selections. Careful coordination of the Submittal Schedule by the Contractor is required so as not to delay the Work.
- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
- a. Project name.
- b. Date.
- c. Name of Architect.
- d. Name of Construction Manager.
- e. Name of subcontractor.
- f. Name of supplier.
- g. Name of manufacturer.

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- h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- 4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- 5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.
 - a. Transmittal Form for Paper Submittals: Use Contractor's standard transmittal form. Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Architect.
 - 6) Name of Construction Manager.
 - 7) Name of firm or entity that prepared submittal.
 - 8) Names of subcontractor, manufacturer, and supplier.
 - 9) Category and type of submittal.
 - 10) Submittal purpose and description.
 - 11) Specification Section number and title.
 - 12) Specification paragraph number or drawing designation and generic name for each of multiple items.
 - 13) Drawing number and detail references, as appropriate.
 - 14) Indication of full or partial submittal.
 - 15) Transmittal number, numbered consecutively.
 - 16) Submittal and transmittal distribution record.
 - 17) Remarks.
 - 18) Signature of transmitter.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested



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by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
 - 2. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
 - 3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.



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- b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
- a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
- a. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 3. Submit Shop Drawings in the following format:
 - a. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:



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- a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."



- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- I. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.

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7. Limitations of use.

- S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."



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- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Stamp or statement shall include the following: "The Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents."

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
1. Approved: Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 2. Approved As Noted: Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 3. Revise and Resubmit or Not Approved: Returned for Resubmittal. Do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark. Do not use, or allow others to use, submittals marked "Not Approved" or "Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.
 4. Action Not Required: Where a submittal is for information or record purposes or special processing or other activity
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00



SECTION 01 40 00

QUALITY REQUIREMENTS

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. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for testing and inspecting allowances.
 - 2. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 3. Division 01 Section "Execution" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 4. Divisions 02 through 48 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and



completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

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- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the



minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

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1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.
 - 1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
 - 2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award or Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.



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- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, and telephone number of technical representative making report.



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2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- 1.8 QUALITY ASSURANCE
- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.



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- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- K. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor.



Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

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- L. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed, unless otherwise indicated.

1.9 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated in individual specification sections as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Payment for these services will be made by Owner.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.



5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction when they so direct.

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- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.



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- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
 - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

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SECTION 01 60 00

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 01 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 01 Section "Allowances" for products selected under an allowance.
 - 2. Division 01 Section "Alternates" for products selected under an alternate.
 - 3. Division 01 Section "References" for applicable industry standards for products specified.
 - 4. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.

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, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
- 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.



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1.4 ACTION SUBMITTALS

- A. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 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.
- B. Products with asbestos: Asbestos containing materials are not to be purchased or installed in this project.

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.



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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 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 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.



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4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
6. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved substitute" or approved," comply with provisions in "Product Substitutions" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Substitutions for Contractor's convenience will not be considered.
3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Substitutions for Contractor's convenience will be considered, unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product.
4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed manufacturer.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated 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 requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product or manufacturer.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

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1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

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- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (Not Used)

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SECTION 01 73 00

EXECUTION

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. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Installation of the Work.
 - 2. Cutting and patching.
 - 3. Progress cleaning.
 - 4. Starting and adjusting.
 - 5. Protection of installed construction.
 - 6. Correction of the Work.
- B. Related Sections:
 - 1. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 2. Division 01 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.
 - 3. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.
 - 4. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.



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1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.5 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, 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; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Architect that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. 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.



- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

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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 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.



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- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.



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1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

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.
 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. For general construction, each trade shall pick up the debris and rubbish, generated by that trade, and dispose of in dumpsters furnished by the General Contractor.
- E. 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.
- F. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- G. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- H. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."
- I. 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.
- J. 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.
- K. 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.

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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 01 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.



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- B. Comply with manufacturer's written instructions for temperature and relative humidity.
- C. Protect resilient flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.
 - 1. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.
 - 2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- D. Protect roofing materials against cuts, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period.
 - 1. Cover roofing products with plywood or suitable protection cover until inspection for Substantial Completion.
 - 2. Do not move heavy and sharp objects directly over roof surfaces. Place plywood or hardboard panels over roofing and under objects while they are being moved. Slide or roll objects over panels without moving panels.

3.8 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 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 01 73 00



SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.

1.2 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
1. Primary operational systems and equipment.
 2. Air or smoke barriers.
 3. Fire-protection systems.
 4. Mechanical systems piping and ducts.
 5. Control systems.
 6. Communication systems.
 7. Conveying systems.
 8. Electrical wiring systems.
 9. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain-wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels, and equipment.
 6. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.



1.4 WARRANTY

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

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or



adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, ~~not~~ hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

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SECTION 01 77 00

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 01 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. Substantial Completion procedures.
 - 2. Inspection procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Execution" for progress cleaning of Project site.
 - 2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 02 through 48 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.



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1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.



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5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. 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.

1.7 FINAL COMPLETION

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit all documents required for LEED Certification.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. 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. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.



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1.8 INSPECTION FEES

- A. If the Architect performs re-inspections due to the failure of the work to comply with the claims of Status of Completion made by the Contractor, or, should the contractor fail to complete the work, or should the contractor fail to promptly correct warranty items or work later found to be deficient:
1. Owner will compensate Architect for such additional services.
 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.
- B. If the Work is not completed by the date set in the Agreement, and the Architect needs to perform additional Contract Administrative and on site observation duties:
1. Owner will compensate Architect for such additional services.
 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.9 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization 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 from lowest floor to highest floor.
 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 and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.
 4. Architect will submit list of incomplete items in the following format:
 - a. One paper copy of product schedule or list, unless otherwise indicated.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.



C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

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D. Provide additional copies of each warranty to include in operation and maintenance manuals.

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.
1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

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:



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- a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- l. 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.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
- m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- n. Replace parts subject to unusual operating conditions.
- o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
- r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- s. Leave Project clean and ready for occupancy.



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- C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

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SECTION 01 78 23

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 01 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 and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 4. Divisions 02 through 48 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 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.



1. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
1. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

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PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."



2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- 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:

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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 and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Agent.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. 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.

- E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - 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, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.



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2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. 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 storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch 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.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.



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2.4 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. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. 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.



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2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product 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. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. 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.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- 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:



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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 Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.



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- C. 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.
- D. 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.
- E. 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 01 Section "Project Record Documents."
- F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23



SECTION 01 78 39

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 01 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.
 - 4. Miscellaneous record submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 48 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit three (3) sets of marked-up Record Prints as follows:
 - a. Owner: two (2) copies.
- B. Record Specifications: Submit two (2) copies of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit two (2) 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.



- D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

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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.
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 and Construction Manager.
 - e. Name of Contractor.

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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.
- B. Format: Submit record Specifications as paper copy.

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.
- B. Format: Submit record Product Data as paper copy.
1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.



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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.
- B. Format: Submit miscellaneous record submittals as paper copy.
 - 1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

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 and Construction Manager's reference during normal working hours.

END OF SECTION 01 78 39



SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected site elements.
 - 2. Patching and repairs.

1.2 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- 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.

1.3 PERFORMANCE REQUIREMENTS

- A. Design, furnish, install, monitor, and maintain temporary shoring, support and protection systems capable of supporting existing structure and construction loads.
 - 1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.
 - 2. Install temporary shoring, support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to demolition area.

1.4 SUBMITTALS

- A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for temporary shoring, support and protection systems.
 - 1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- B. 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.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
7. Locations of temporary partitions and means of egress.



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1.5 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review structural load limitations of existing structure.
 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.6 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials:
 1. Hazardous materials will be removed by Owner before start of the Work.
 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

- A. Existing Special Warranty: 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 (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION



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- 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 the intended function or design are encountered, investigate and measure the nature and extent of the 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 Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section "Summary."
 - 2. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

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. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities and Controls."



- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

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1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, 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.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete to a depth of at least **3/4 inch (19 mm)** at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.



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- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- F. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 7 Sections for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing metal edge flashings.
 - 3. Existing roofing wood nailers shall remain in place.
 - 4. Existing roof rigid insulation shall remain in place; remove insulation in designated areas only.
- G. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.
- D. Enter into a contract for the transportation and disposal of all solid waste in accordance with the applicable State, Local and Federal regulations.

3.7 CLEANING

- A. Sweep the building broom clean on completion of selective demolition operation.
- B. Change filters on air-handling equipment on completion of selective demolition operations.

END OF SECTION 02 41 19

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.
- B. Cast-in-place concrete includes the following:
 - 1. Foundations and footings.
 - 2. Slabs-on-grade.
 - 3. Foundation walls.
 - 4. Slabs on metal decking.
 - 5. **Exposed Finished Interior Slabs**
(-Provide mockup for architect and owner's approval prior to placement)

1.2 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, pour stops, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
- C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.
- D. Shop drawings for formwork indicating fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.
 - 1. Architect's review is for general architectural applications and features only. Designing formwork for structural stability and efficiency is Contractor's responsibility.
- E. Samples of materials as requested by Architect, including names, sources, and descriptions, as follows:
 - 1. Color finishes.
 - 2. Normal weight aggregates.
 - 3. Fiber reinforcement.
 - 4. Reglets.
 - 5. Waterstops.
 - 6. Vapor retarder/barrier.



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- 7. Form liners.
- F. Laboratory test reports for concrete materials and mix design test.
- G. Material certificates in lieu of material laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.
- H. Minutes of pre-installation conference.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Testing Service: Engage a testing agency acceptable to Architect to perform material evaluation tests and to design concrete mixes per the requirements of chapter 17 of the IBC.
- C. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.
- D. Mockup: At the architects request cast mockup of size indicated or as required to demonstrate typical joints, form tie spacing, and proposed surface finish, texture, and color. Maintain sample panel exposed to view for duration of Project, after Architect's acceptance of visual qualities.
 - 1. Demolish mockup and remove from site when directed by Architect.
- A. E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
 - 1. At least 7 days prior to submitting design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including, but not limited to, the following:
 - a. Contractor's superintendent.
 - b. Agency responsible for concrete design mixes.
 - c. Agency responsible for field quality control.
 - d. Agency responsible for quality assurance testing.



- e. Ready-mix concrete producer.
- f. Concrete subcontractor.
- g. Primary admixture manufacturers.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
 - 1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.
 - 2. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Textured Finish Concrete: Units of face design, size, arrangement, and configuration to match Architect's control sample. Provide solid backing and form supports to ensure stability of textured form liners.
- D. Forms for Cylindrical Columns and Supports: Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
- G. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Do not allow form release agent to be applied on reinforcing steel.
- H. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches (38 mm) to the plane of the exposed concrete surface.
 - 1. Provide ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in the concrete surface.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615 Grade 60 (ASTM A 615M Grade 400), deformed.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.



D. Deformed-Steel Welded Wire Fabric: ASTM A 497.

E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

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1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I, use Type II at all concrete in contact with soils.

1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.

B. Fly Ash: ASTM C 618, Type F. The use of Fly Ash and/or Blast Furnace Slag is **encouraged**, except for use in interior slabs. Do not exceed 35% of cement weight.

C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.

1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
2. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect and Engineer.

D. Water: Potable.

E. Fiber Reinforcement: Polypropylene fibrillated fibers engineered and designed for secondary reinforcement of concrete slabs, complying with ASTM C 1116, Type III, not less than 3/4 inch long.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Gilco Fibers, Cormix Construction Chemicals.
 - b. Durafiber, Durafiber Corp.
 - c. Fiberstrand 100, Euclid Chemical Co.
 - d. Fibermesh, Fibermesh Co., Div. Synthetic Industries, Inc.
 - e. Forta, Forta Corp.



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- f. Grace Fibers, W.R. Grace & Co.
- g. Polystrand, Metalcrete Industries
- F. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Air-Tite, Cormix Construction Chemicals.
 - b. Air-Mix or Perma-Air, Euclid Chemical Co.
 - c. Darex AEA or Daravair, W.R. Grace & Co.
 - d. MB-VR or Micro-Air, Master Builders, Inc.
 - e. Sealtight AEA, W.R. Meadows, Inc.
 - f. Sika AER, Sika Corp.
- H. Water-Reducing Admixture: ASTM C 494, Type A.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Chemtard, ChemMasters Corp.
 - b. PSI N, Cormix Construction Chemicals.
 - c. Eucon WR-75, Euclid Chemical Co.
 - d. WRDA, W.R. Grace & Co.
 - e. Pozzolith Normal or Polyheed, Master Builders, Inc.
 - f. Metco W.R., Metalcrete Industries.
 - g. Prokrete-N, Prokrete Industries.
 - h. Plastocrete 161, Sika Corp.
- I. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.



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1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Super P, Anti-Hydro Co., Inc.
 - b. Cormix 200, Cormix Construction Chemicals.
 - c. Eucon 37, Euclid Chemical Co.
 - d. WRDA 19 or Daracem, W.R. Grace & Co.
 - e. Rheobuild or Polyheed, Master Builders, Inc.
 - f. Superslump, Metalcrete Industries.
 - g. PSPL, Prokrete Industries.
 - h. Sikament 300, Sika Corp.
- J. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.
1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Q-Set, Conspec Marketing & Manufacturing Co.
 - b. Lubricon NCA, Cormix Construction Chemicals.
 - c. Accelguard 80, Euclid Chemical Co.
 - d. Daraset, W.R. Grace & Co.
 - e. Pozzutec 20, Master Builders, Inc.
 - f. Accel-Set, Metalcrete Industries.
- K. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. PSI-R Plus, Cormix Construction Chemicals.
 - b. Eucon Retarder 75, Euclid Chemical Co.
 - c. Daratard-17, W.R. Grace & Co.



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- d. Pozzolith R, Master Builders, Inc.
- e. Protard, Prokrete Industries.
- f. Plastiment, Sika Corporation.

2.4 RELATED MATERIALS

- A. Reglets: Where sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.0217- inch- (0.46-mm-) thick galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.
- B. Waterstops: Provide flat, dumbbell-type or centerbulb-type waterstops at construction joints and other joints as indicated. Size to suit joints.
- C. Rubber Waterstops: Corps of Engineers CRD-C 513.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - a. The Burke Co.
 - b. Progress Unlimited.
 - c. Williams Products, Inc.
- D. Polyvinyl Chloride Waterstops: Corps of Engineers CRD-C 572.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - a. The Burke Co.
 - b. Greenstreak Plastic Products Co.
 - c. W.R. Meadows, Inc.
 - d. Progress Unlimited.
 - e. Schlegel Corp.
 - f. Vinylex Corp.



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- F. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:
1. Polyethylene sheet not less than 8 mils (0.2 mm) thick.
 2. Water-resistant barrier consisting of heavy kraft papers laminated together with glass-fiber reinforcement and overcoated with black polyethylene on each side.
 - a. Product: Subject to compliance with requirements, provide Moistop by Fortifiber Corporation.
- G. Vapor Barrier: Premolded seven-ply membrane consisting of reinforced core and carrier sheet with fortified bitumen layers, protective weathercoating, and plastic antistick sheet. Water vapor transmission rate of 1 perm when tested according to ASTM E 96, Method B. Provide manufacturer's recommended mastics and gusset tape.
1. Product: Subject to compliance with requirements, provide Sealtight Premoulded Membrane by W.R. Meadows, Inc.
- H. Nonslip Aggregate Finish: Provide fused aluminum oxide granules or crushed emery as the abrasive aggregate for a nonslip finish, with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rustproof, nonglazing, and unaffected by freezing, moisture, and cleaning materials.
- J. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m), complying with AASHTO M 182, Class 2.
- K. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
1. Waterproof paper.
 2. Polyethylene film.
 3. Polyethylene-coated burlap.
- L. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. m when applied at 200 sq. ft./gal (4.9 sq. m/L).
1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. A-H 3 Way Sealer, Anti-Hydro Co., Inc.
 - b. Spartan-Cote, The Burke Co.
 - c. Conspec #1, Conspec Marketing & Mfg. Co.
 - d. Sealco 309, Cormix Construction Chemicals.



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- e. Day-Chem Cure and Seal, Dayton Superior Corp.
 - f. Eucocure, Euclid Chemical Co.
 - g. Horn Clear Seal, A.C. Horn, Inc.
 - h. L&M Cure R, L&M Construction Chemicals, Inc.
 - i. Masterkure, Master Builders, Inc.
 - j. CS-309, W.R. Meadows, Inc.
 - k. Seal N Kure, Metalcrete Industries.
 - l. Kure-N-Seal, Sonneborn-Chemrex.
 - m. Stontop CS2, Stonhard, Inc.
- M. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.
- 1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
 - 2. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Highseal, Conspec Marketing and Mfg. Co.
 - b. Sealco - VOC, Cormix Construction Chemicals.
 - c. Safe Cure and Seal, Dayton Superior Corp.
 - d. Aqua-Cure, Euclid Chemical Co.
 - e. Dress & Seal WB, L&M Construction Chemicals, Inc.
 - f. Masterkure 100W, Master Builders, Inc.
 - g. Vocomp-20, W.R. Meadows, Inc.
 - h. Metcure, Metalcrete Industries.
 - i. Stontop CS1, Stonhard, Inc.
- N. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:



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2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aquafilm, Conspec Marketing and Mfg. Co.
 - b. Eucobar, Euclid Chemical Co.
 - c. E-Con, L&M Construction Chemicals, Inc.
 - d. Confilm, Master Builders, Inc.
 - e. Waterhold, Metalcrete Industries.

- O. Underlayment Compound: Free-flowing, self-leveling, pumpable, cement-based compound for applications from 1 inch (25 mm) thick to feathered edges.
 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. K-15, Ardex, Inc.
 - b. Self-Leveling Wear Topping, W.R. Bonsal Co.
 - c. Conflow, Conspec Marketing and Mfg. Co.
 - d. Corlevel, Cormix Construction Chemicals.
 - e. LevelLayer II, Dayton Superior Corp.
 - f. Flo-Top, Euclid Chemical Co.
 - g. Gyp-Crete, Gyp-Crete Corp.
 - h. Levelex, L&M Construction Chemicals, Inc.
 - i. Underlayment 110, Master Builders, Inc.
 - j. Stoncrete UL1, Stonhard, Inc.
 - k. Concrete Top, Symons Corp.
 - l. Thoro Underlayment Self-Leveling, Thoro System Products.

- P. Bonding Agent: Polyvinyl acetate or acrylic base.
 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Polyvinyl Acetate (Interior Only):



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- 1) Superior Concrete Bonder, Dayton Superior Corp.
 - 2) Euco Weld, Euclid Chemical Co.
 - 3) Weld-Crete, Larsen Products Corp.
 - 4) Everweld, L&M Construction Chemicals, Inc.
 - 5) Herculox, Metalcrete Industries.
 - 6) Ready Bond, Symons Corp.
- b. Acrylic or Styrene Butadiene:
- 1) Acrylic Bondcrete, The Burke Co.
 - 2) Strongbond, Conspec Marketing and Mfg. Co.
 - 3) Day-Chem Ad Bond, Dayton Superior Corp.
 - 4) SBR Latex, Euclid Chemical Co.
 - 5) Daraweld C, W.R. Grace & Co.
 - 6) Hornweld, A.C. Horn, Inc.
 - 7) Everbond, L&M Construction Chemicals, Inc.
 - 8) Acryl-Set, Master Builders Inc.
 - 9) Intralok, W.R. Meadows, Inc.
 - 10) Acrylpave, Metalcrete Industries.
 - 11) Sonocrete, Sonneborn-Chemrex.
 - 12) Stonlock LB2, Stonhard, Inc.
 - 13) Strong Bond, Symons Corp.
- Q. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.
1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Burke Epoxy M.V., The Burke Co.
 - b. Spec-Bond 100, Conspec Marketing and Mfg. Co.



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- c. Resi-Bond (J-58), Dayton Superior.
- d. Euco Epoxy System #452 or #620, Euclid Chemical Co.
- e. Epoxitite Binder 2390, A.C. Horn, Inc.
- f. Epabond, L&M Construction Chemicals, Inc.
- g. Coneresive Standard Liquid, Master Builders, Inc.
- h. Rezi-Weld 1000, W.R. Meadows, Inc.
- i. Metco Hi-Mod Epoxy, Metalcrete Industries.
- j. Sikadur 32 Hi-Mod, Sika Corp.
- k. Stonset LV5, Stonhard, Inc.
- l. R-600 Series, Symons Corp.

2.5 PROPORTIONING AND DESIGNING MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
 1. Do not use the same testing agency for field quality control testing.
 2. Limit use of fly ash and blast furnace slag to not exceed 35 percent of cement content by weight.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect and Engineer of Record.
- C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:
 1. 3,000 psi, 28-day compressive strength; water-cement ratio, 0.60 maximum (non-air-entrained)
 2. 4,000 psi, 28-day compressive strength; water-cement ratio, 0.5 maximum, (5% air-entrained)
 3. 4,000 psi, 28-day compressive strength; water-cement ratio, 0.45 maximum (6% air-entrained), w/ Fibermesh
 3. 3,500 psi, 28-day compressive strength; water-cement ratio, 0.50 maximum (3% air-entrained), w/ Fibermesh
- D. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:



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1. Subjected to freezing and thawing: W/C 0.45.
- E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
1. Ramps, slabs, and sloping surfaces: Not more than 3 inches (75 mm).
 2. Reinforced foundation systems: Not less than 2 inch and not more than 6 inches.
 3. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches (200 mm) after adding admixture to site-verified 2 - 3 inch (50 - 75 mm) slump concrete.
 4. Other concrete: Not more than 4 inches (100 mm).
- F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work.
- G. Fiber Reinforcement: Add at manufacturer's recommended rate but not less than 1.5 lb/cu. yd. (0.9 kg/cu. m).

2.6 ADMIXTURES

- A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
- B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
- C. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water-cement ratios below 0.50.
- D. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:
 1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure:
 - a. 4.0 percent (moderate exposure); 6.0 percent (severe exposure) for 3/4 inch (19 mm) maximum aggregate.
 2. Other concrete not exposed to freezing, thawing, or hydraulic pressure, or to receive a surface hardener: 2 to 4 percent air.
- E. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.



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2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
1. When air temperature is between 85 deg F (29 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.8 FLOOR AND SLAB TREATMENTS

- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.
- D. Pigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, nonfading mineral oxides interground with cement.
1. Colors: Match Architect's samples.
 2. Colors: As indicated by referencing manufacturer's designations.
 3. Colors: As selected by Architect from manufacturer's full range for these characteristics.
- E. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
- F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- G. Products: Subject to compliance with requirements, provide one of the following:
1. Unpigmented Mineral Dry-Shake Floor Hardener:
 - a. Non-Metallic Floor Hardener; Burke Group, LLC (The).
 - b. Concolor; ChemMasters.
 - c. Conshake 500; Conspec Marketing & Manufacturing Co., Inc.
 - d. Quartz Tuff; Dayton Superior Corporation.
 - e. Surfex; Euclid Chemical Co.
 - f. Tycron; Kaufman Products, Inc.
 - g. Colorhard; Lambert Corporation.
 - h. Quartzplate; L&M Construction Chemicals, Inc.
 - i. Maximent; Master Builders, Inc.
 - j. Floor Quartz; Metalcrete Industries.
 - k. Hard Top; Richmond Screw Anchor Co.
 - l. Lithochrome Color Hardener; L. M. Scofield Co.
 - m. Harcol; Sonneborn, Div. of ChemRex, Inc.



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- n. Durag Premium; Sternson Group.
 - o. Hard Top; Symons Corporation.
2. Pigmented Mineral Dry-Shake Floor Hardener:
- a. Non-Metallic Floor Hardener; Burke Group, LLC (The).
 - b. Concolor; ChemMasters.
 - c. Conshake 600; Conspec Marketing & Manufacturing Co., Inc.
 - d. Quartz Tuff; Dayton Superior Corporation.
 - e. Surfex; Euclid Chemical Co.
 - f. Tycron; Kaufman Products, Inc.
 - g. Colorhard; Lambert Corporation.
 - h. Quartzplate; L&M Construction Chemicals, Inc.
 - i. Maximent; Master Builders, Inc.
 - j. Floor Quartz; Metalcrete Industries.
 - k. Lithochrome Color Hardener; L. M. Scofield Co.
 - l. Harcol; Sonneborn, Div. of ChemRex, Inc.
 - m. Colorplete; Sternson Group.
3. Penetrating Liquid Floor Treatment:
- a. Titan Hard; Burke Group, LLC (The).
 - b. Chemisil Plus; ChemMasters.
 - c. Intraseal; Conspec Marketing & Manufacturing Co., Inc.
 - d. Ashford Formula; Curecrete Chemical Co., Inc.
 - e. Day-Chem Sure Hard; Dayton Superior Corporation.
 - f. Euco Diamond Hard; Euclid Chemical Co.
 - g. Seal Hard; L&M Construction Chemicals, Inc.
 - h. Vexcon Starseal PS; Vexcon Chemicals, Inc.

PART 3 - EXECUTION

3.1 GENERAL

- A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel and Insulated Concrete Forms

3.2 FORMS

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

- 1. **Provide Class A tolerances for concrete surfaces exposed to view.**
- 2. Provide Class C tolerances for other concrete surfaces.



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- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulk heads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.
- D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.4 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
 - 1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.
- D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.



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- E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.
- B. Provide keyways at least 1-1/2 inches (38 mm) deep in construction joints in walls and slabs. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's printed instructions.
- F. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."
- G. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch (3 mm) wide by one-fourth of slab depth or inserts 1/4 inch (6 mm) wide by one-fourth of slab depth, unless otherwise indicated.
 - 1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
 - 2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
 - 3. If joint pattern is not shown, provide joints not exceeding 12 ft. (4.5 m) in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
 - 4. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

3.6 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.



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- B. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
- C. Install dovetail anchor slots in concrete structures as indicated on drawings.
- D. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.7 PREPARING FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
 - 1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.8 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.



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- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position on chairs during concrete placement.
- F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- G. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
 4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch (6 mm) in height rubbed down or chipped off.



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- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, paint, or another similar system. This is an as-cast concrete surface obtained with selected form facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than 1 day after form removal.
 - 1. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Grout-Cleaned Finish: Provide grout-cleaned finish on scheduled concrete surfaces that have received smooth-formed finish treatment.
 - 1. Combine one part portland cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard portland cement and white portland cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.
 - 2. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
 - 1. After placing slabs, finish surface to tolerances of F(F) 15 (floor flatness) and F(L) 13 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-



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floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth granular texture.

- C. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.
 - 1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Grind smooth any surface defects that would telegraph through applied floor covering system.
- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.
- E. Nonslip Broom/Grooved Finish: Apply a nonslip broom/grooved finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen concrete surface by brooming/grooveing with fiber-bristle broom perpendicular to main traffic route or groove trowel as specified by Architect. Coordinate required final finish with Architect before application.
- F. Nonslip Aggregate Finish: Apply nonslip aggregate finish to concrete stair treads, platforms, ramps, sloped walks, and where indicated.
 - 1. After completing float finishing and before starting trowel finish, uniformly spread dampened nonslip aggregate at a rate of 25 lb per 100 sq. ft. (12 kg/10 sq. m) of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as specified.
 - 2. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose nonslip aggregate.
- H. Mineral Dry-Shake Floor Hardener Finish: After initial floating, apply mineral dry-shake materials to surfaces according to manufacturer's written instructions and as follows:
 - 1. Uniformly apply mineral dry-shake materials at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m), unless greater amount is recommended by manufacturer.
 - 2. Uniformly distribute approximately two-thirds of mineral dry-shake materials over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second mineral dry-shake application, uniformly distributing remainder of material, and embed by power floating.



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3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake material manufacturer and apply immediately after final finishing.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:
 1. Keep concrete surface continuously wet by covering with water.
 2. Use continuous water-fog spray.
 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4 inch (100 mm) lap over adjacent absorptive covers.
- E. Provide moisture-retaining cover curing as follows:
 1. Cover concrete surfaces, including exposed interior slabs, with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least



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3 inches (75 mm) and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- F. Apply curing compound on exposed exterior slabs, walks, and curbs as follows:
 - 1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
- G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
 - 1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.13 LIQUID FLOOR TREATMENTS

- I. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than seven days old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- J. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 REMOVING FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 per-



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cent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

- C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.15 REUSING FORMS

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

3.16 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.
- B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh (1.2 mm) sieve, using only enough water as required for handling and placing.
 - 1. Cut out honeycombs, rock pockets, voids over 1/4 inch (6 mm) in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch (25 mm). Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
 - 2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
 - 1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.



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1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
 3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
 4. Repair defective areas, except random cracks and single holes not exceeding 1 inch (25 mm) in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- E. Repair isolated random cracks and single holes 1 inch (25 mm) or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- F. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.
- G. Repair methods not specified above may be used, subject to acceptance of Architect.
- 3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION
- A. General: The Owner will employ a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect or Owners Representative.
1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94. Provide one set of tests for each 50 cu. yd. of each type of concrete for each day's pour; provide one set of tests of the following:
 - a. Slump: ASTM C 143; one test at point of discharge; additional tests when concrete consistency seems to have changed.
 - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete.
 - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below.



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- d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - e. Compressive-Strength Tests: ASTM C 39; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 3. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).
- C. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 03 30 00



SECTION 05 51 00

METAL STAIRS AND RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Handrails and railings at concrete ramp

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.
 - 1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m) or a concentrated load of 300 lbf (1.33 kN) on an area of 4 sq. in. (25.8 sq. cm), whichever produces the greater stress.
 - 2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
 - 3. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.
- B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding structural loads required by ASCE 7 without exceeding the allowable design working stress of materials for handrails, railings, anchors, and connections.

1.3 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for metal stairs. Include plans, elevations, sections, and details of metal stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.



- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- D. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- E. Uncoated, Cold-Rolled Steel Sheet: Commercial quality, complying with ASTM A 366/A 366M; or structural quality, complying with ASTM A 611, Grade A, unless another grade is required by design loads.
- F. Uncoated, Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A 569M; or structural quality, complying with ASTM A 570/A 570M, Grade 30, unless another grade is required by design loads.
- G. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.2 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- D. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- E. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
- F. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.



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1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.3 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 CONCRETE FILL AND REINFORCING MATERIALS

- A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless higher strengths are indicated.
- B. Welded Wire Fabric: ASTM A 185, 6 by 6 inches (152 by 152 mm)--W1.4 by W1.4, unless otherwise indicated.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, handrails, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 1. Join components by welding, unless otherwise indicated.
 2. Use connections that maintain structural value of joined pieces.
 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
 1. Commercial class, unless otherwise indicated.
- C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.
- D. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Weld connections to comply with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.



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4. Weld exposed corners and seams continuously, unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS

- A. Stair Framing: Fabricate stringers of structural-steel channels, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
1. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods to support landings from floor construction above. Locate hanger rods within stud space of shaft-wall construction.
- B. Metal Risers, Subtread Pans, and Subplatforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 0.0677 inch (1.7 mm).
1. Steel Sheet: Uncoated cold-rolled steel sheet, unless otherwise indicated.
 2. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
 3. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.7 STEEL TUBE HANDRAILS AND RAILINGS

- A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
1. Configuration: As indicated on the drawings.
 2. Gates: Form gates from steel tube of same size and shape as top rails. Provide with hinges for fastening to wall and overlapping stop with rubber bumper to restrict gate to opening in the direction of egress.
- B. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
1. At tee and cross intersections, cope ends of intersecting members to fit contour of tube to which end is joined, and weld all around.
- C. Form changes in direction of handrails and rails as follows:
1. As detailed.
 2. By bending.
 3. By flush-radius bends.



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4. By radius bends of radius indicated.
 5. By inserting prefabricated flush-elbow fittings.
 6. By any method indicated above, applicable to change of direction involved.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of handrail and railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting railings and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.
- I. For nongalvanized handrails and railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
- 2.8 FINISHES
- A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Galvanizing: Provide coating for iron and steel fabrications applied by the hot-dipped process. The galvanizing bath shall contain high grade zinc and other earthly materials. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed products:
1. Exteriors (SSPC Zone 1B): SSPC SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."



- E. Apply shop primer to prepared surfaces of metal stair components, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Do not apply primer to galvanized surfaces.
 - 2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING STEEL TUBE RAILINGS AND HANDRAILS

- A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
 - 1. Anchor posts to steel by welding directly to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.



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- B. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
1. Use type of bracket with predrilled hole for exposed bolt anchorage.
 2. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 3. For hollow masonry anchorage, use toggle bolts.
 4. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

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SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking and nailers.
 - 4. Sheathing.
 - 5. Subflooring and underlayment.
 - 6. Plywood backing panels.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.



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4. Provide kiln dry lumber, unless otherwise indicated.

B. Wood Structural Panels:

1. Plywood: DOC PS 1.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Pressure-Treated Wood: In accordance with AWPA C2 (lumber) and AWPA C9 (plywood).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and the following:
 - a. Copper azole, Type B (CA-B).
2. Preservative Retention:
 - a. Decking: 0.08 pcf.
 - b. Above Ground: 0.10 pcf.
 - c. Ground or Fresh Water Contact: 0.21 pcf.
3. Species: Mixed southern pine; SPIB.
4. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece, or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches (460 mm) above grade.
4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

E. Product: Acceptable products include but are not limited to the following:

1. Wolmanized Natural Select Wood by Arch Treatment Technologies, Inc.

F. Substitutions: The specified product can be used with standard galvanized fasteners. Any proposed substitution should be made with the understanding that stainless steel fasteners will have to be used unless written verification can be provided to show that galvanized fasteners are allowed with substitute product.

2.3 DIMENSION LUMBER



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- A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Framing, Rafters, Joists, and Partitions: No. 2 grade and any of the following species:
 - 1. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
 - 1. Rooftop equipment bases and support curbs.
 - 2. Blocking.
 - 3. Nailers.
- B. For items of dimension lumber size, provide No. 2 grade lumber, kiln dried and any of the following species:
 - 1. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.5 SHEATHING

- A. Plywood Wall Sheathing: APA rated sheathing, Exposure 1, plywood.
 - 1. Span Rating: Not less than 24/16.
 - 2. Thickness: As indicated on the drawings.
- B. Plywood Roof Sheathing: APA rated sheathing, Exposure 1, plywood.
 - 1. Span Rating: Not less than 40/20.
 - 2. Thickness: As indicated on the drawings.

2.6 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Subflooring: Tongue & Groove, APA rated sheathing, Exposure 1, single-floor panels or sheathing.
 - 1. Span Rating: Not less than Sturd-i-floor "24" or 40/20.
 - 2. Thickness: Not less than 3/4 inch.
- B. Plywood Underlayment for Resilient Flooring or Ceramic Tile: DOC PS 1, Exterior A-C with fully sanded face.

2.7 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4 inch (19 mm) thick. Paint flat black as required by electrical code.

2.8 FASTENERS



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- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: Hilti Kwik-Flex or Elco Dril-Flex; no substitutes,
 - 1. Plywood sheathing: 10-24 x 1-1/4 inch wafer head #3.
 - 2. 2 x wood blocking: 12-24 x 2-1/2 inch wafer head #3.
- F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.9 METAL FRAMING ANCHORS

- A. General: Provide framing anchors made from metal indicated, of type, and size indicated, By “Simpson Strong Tie”, and as follows:
 - 1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
 - 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated in “Simpson Design Catalog, C-2007”. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

PART 3 - EXECUTION



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3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Apply field treatment complying with AWPAC M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. Table 2304.9.1, "Fastening Schedule," in the International Building Code.
- E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; pre-drill for Lag screws, and as required by fastener manufacturer.
- F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

3.3 WOOD FRAMING INSTALLATION, GENERAL

- A. Framing Standard: Comply with AFPA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Do not splice structural members between supports.
- C. Where built-up beams or girders of 2-inch nominal- (38-mm actual-) dimension lumber on edge are required, fasten together with 2 rows of 16d nails spaced not less than 16 inches (406 mm) o.c. Locate one row near top edge and other near bottom edge.
 - 1. For continuous members, locate end joints over supports.



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3.4 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as follows:
1. Where supported on wood members, by toe nailing or by using metal framing anchors, if indicated on plans.
 2. Where framed into wood supporting members, by using wood ledgers and metal joist hangers as indicated.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches (76 mm) and do not embed more than 4 inches (102 mm).
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches (1200 mm).
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches (50 mm) from top or bottom.
- E. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist over supports.
- G. Provide solid blocking between joists under jamb studs for openings.
- H. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- I. Provide bridging of type indicated below, at intervals of 96 inches (2438 mm) o.c., between joists.
1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- (19-by-64-mm actual-) size lumber, double-crossed and nailed at both ends to joists.
 2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.5 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
1. Subflooring:
 - a. Glue and screw to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.

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2. Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
3. Underlayment:
 - a. Screw to subflooring.
 - b. Space panels 1/32 inch (0.8 mm) apart at edges and ends.
 - c. Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.
 4. Plywood Backing Panels: Nail or screw to supports.

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SECTION 06 17 53

SHOP FABRICATED METAL-PLATE-CONNECTED WOOD TRUSSES

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 wood roof and girder trusses and truss accessories.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for roof sheathing and subflooring and dimension lumber for supplementary framing and permanent bracing.

1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. NLGA - National Lumber Grades Authority.
 - 3. SPIB - Southern Pine Inspection Bureau.
 - 4. WCLIB - West Coast Lumber Inspection Bureau.
 - 5. WWPA - Western Wood Products Association.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: Live Loads as Indicated, plus snow drift and dead load
 - 2. Maximum Deflection Under Design Loads:
 - a. Roof Trusses: Vertical deflection of 1/360 LL, 1/ 240 TL of span.
 - b. Floor Trusses: Vertical deflection of 1/600 LL, 1/240 TL of span.



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1.5 SUBMITTALS

- A. Product Data: For metal-plate connectors, metal framing anchors, bolts, and fasteners.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements, including bending strength, stiffness, and fastener-holding capacity. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5664.
 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice details; type, size, material, finish, design values, orientation, and location of metal connector plates; and bearing details.
1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.
- D. Qualification Data: For metal-plate manufacturer, professional engineer, fabricator and Installer.
- E. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.
- F. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Preservative-treated wood.
 2. Metal-plate connectors.
 3. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.



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1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis stamped by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that involves inspection by SPIB, Timber Products Inspection, TPI, or other independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
- C. Source Limitations for Connector Plates: Obtain metal connector plates through one source from a single manufacturer.
- D. Comply with applicable requirements and recommendations of the following publications:
1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
 3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
- E. Wood Structural Design Standard: Comply with applicable requirements in AFPA's "National Design Specifications for Wood Construction" and its "Supplement."
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Comply with TPI recommendations to avoid damage and lateral bending. Provide for air circulation around stacks and under coverings.
 - B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.
- 1.8 COORDINATION
- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

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. Metal Connector Plates:



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- a. Alpine Engineered Products, Inc.
- b. CompuTrus, Inc.
- c. Eagle Metal Products.
- d. Jager Industries, Inc.
- e. Mitek Industries, Inc.
- f. Robbins Engineering, Inc.
- g. TEE-LOK Corporation.
- h. Truswal Systems Corporation.

2. Metal Framing Anchors:

- a. Alpine Engineered Products, Inc.
- b. Cleveland Steel Specialty Co.
- c. Harlen Metal Products, Inc.
- d. KC Metals Products, Inc.
- e. Silver Metal Products, Inc.
- f. Simpson Strong-Tie Company, Inc.
- g. Southeastern Metals Manufacturing Co., Inc.
- h. United Steel Products Company, Inc.

2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive natural or stained finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified.
 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
 5. Provide dry lumber with 15 percent maximum moisture content at time of dressing.
- B. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement."
- C. Grade and Species: Provide visually graded dimension lumber for truss chord and web members, of the following any of the following species:
 1. Species: Douglas fir-larch; WCLIB or WWPA.
 2. Species: Douglas fir-south; WWPA.
 3. Species: Douglas fir-larch (north); NLGA.
 4. Species: Hem-fir; WCLIB or WWPA.
 5. Species: Hem-fir (north); NLGA.
 6. Species: Southern pine; SPIB.
 7. Species: Mixed southern pine; SPIB.
 8. Species: Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.
 9. Species: Spruce-pine-fir; NLGA.



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- D. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded as follows and of the following minimum design values for size of member required according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement":

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and the following:
 - a. Ammoniacal copper zinc arsenate (ACZA).
 - b. Ammoniacal, or amine, copper quat (ACQ).
 - c. Copper bis (dimethyldithiocarbamate) (CDDC).
 - d. Ammoniacal copper citrate (CC).
 - e. Copper azole, Type A (CBA-A).
 - f. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

2.4 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1 from metal complying with requirements indicated below:
- B. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180) coating designation; Designation SS, Grade 33, and not less than 0.036 inch (0.9 mm) thick.
- C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, 80Z (24G) coating designation; ASTM A 570/A 570M, Structural Steel (SS), Grade 33, and not less than 0.047 inch (1.2 mm) thick.

2.5 FASTENERS



A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

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B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.6 METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:

1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.

2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

C. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of truss and fastens to both sides of truss, face of top plates, and side of stud below.



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- D. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick. Clip is fastened to truss through slotted holes to allow for truss deflection.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.8 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
 - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. Before installing, splice trusses delivered to Project site in more than one piece.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses 16 inches (610 mm) o.c. as indicated; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.



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1. Anchor trusses to girder trusses as indicated.
 - I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 1. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
 - J. Install wood trusses within installation tolerances in TPI 1.
 - K. Do not cut or remove truss members.
 - L. Replace wood trusses that are damaged or do not meet requirements.
 1. Do not alter trusses in field.
- 3.2 REPAIRS AND PROTECTION
- A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
 - B. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
 1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 06 17 53



SECTION 06 20 23

INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.



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2.2 STANDING AND RUNNING TRIM

- A. Softwood Lumber Trim for Paint Finish:
 - 1. Species and Grade: Clear poplar.
 - 2. Finger Jointing: Not allowed.
 - 3. Face Surface: Surfaced (smooth).
 - a. Sand exposed surfaces to provide suitable substrate for paint finish.
 - 4. Provide shaped profiles as shown in general to match standard casing and base types.
 - 5. Eased edges in lieu of radiused edges shall not be allowed.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
 - 1. Where galvanized finish is indicated, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 - 1. Use wood glue that has a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 - 1. Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 FABRICATION

- A. Back out or kerf backs of the following members except those with ends exposed in finished work:
 - 1. Interior standing and running trim except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.



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3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.

3.5 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean interior finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.



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3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during remainder of the construction period.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 23



SECTION 06 40 23

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate cabinets.
 - 2. Plastic-laminate countertops.
 - 3. Maple bench.
 - 4. Shop finishing of hardwood edging and millwork.

1.2 SUBMITTALS

- A. Product Data: For medium-density fiberboard, particleboard, plywood, high-pressure decorative laminate, adhesive for bonding plastic laminate, thermoset decorative overlay, cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.
 - 4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
- C. Samples for Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
 - 1. Shop-applied transparent finishes.
 - 2. Shop-applied opaque finishes.
 - 3. Plastic laminates.
 - 4. Thermoset decorative overlays.
 - 5. Lumber with or for transparent finish, 5 inches (125 mm) wide by 24 inches (600 mm) long, for each species and cut, finished on 1 side and 1 edge.
 - 6. Wood-veneer-faced panel products with or for transparent finish, 8 by 10 inches (200 by 250 mm), for each species and cut. Include at least one face-veneer seam and finish as specified.
 - 7. Exposed cabinet hardware and accessories, one unit for each type and finish.
- D. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.



1.3 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: Plain Sliced American Maple
- 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.
 5. Hardwood Plywood and Face Veneers: HPVA HP-1.
- D. Thermoset Decorative Overlay: Particleboard complying with ANSI A208.1, Grade M-2, or medium-density fiberboard complying with ANSI A208.2, Grade MD, with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
1. Do not use composite wood and agrifiber products containing urea-formaldehyde resins. Additionally, the laminating adhesive used in fabrication of on-site and shop-applied composite wood and agrifiber assemblies must contain no added urea formaldehyde resins.
- E. Plastic Laminate: High-Pressure Decorative Laminate; NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Corporation.
 - b. Lamin-Art.
 - c. Nevamar Decorative Surfaces.
 - d. Pionite Decorative Surfaces .
 - e. Wilsonart International; Div. of Premark International, Inc.
 2. Do not use composite wood and agrifiber products containing urea-formaldehyde resins. Additionally, the laminating adhesive used in fabrication of on-site and shop-applied composite wood and agrifiber assemblies must contain no added urea formaldehyde resins.
- F. Panel Edging: 3mm PVC to match laminate by Dollken-Woodtape or approved equal.
1. Provide for all drawer and door fronts.
 2. Do not use composite wood and agrifiber products containing urea-formaldehyde resins. Additionally, the laminating adhesive used in fabrication of on-site and shop-applied



composite wood and agrifiber assemblies must contain no added urea formaldehyde resins.

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- G. Adhesive for Bonding Plastic Laminate: Contact cement.
1. Do not use composite wood and agrifiber products containing urea-formaldehyde resins. Additionally, the laminating adhesive used in fabrication of on-site and shop-applied composite wood and agrifiber assemblies must contain no added urea formaldehyde resins.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Frameless Concealed Hinges (European Slip-On Type): BHMA A156.9, B01602, 110 degrees of opening, self-closing.
1. Grass G173 and G174.
 2. MEPLA SSP 21-243-S/00 and S/08.
- D. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, 100 pound capacity, baked-on epoxy finish:
1. Grass 6200.
 2. MEPLA 3211.
 3. File Drawer Slides: Grass filing cabinet system 6110 Pendaflex railing, or MEPLA Prosystem, baked-on epoxy finish.
- E. 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. Satin Stainless Steel: BHMA 630.
- F. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION, GENERAL



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- A. Interior Woodwork Grade: Provide Custom grade interior woodwork complying with the 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).
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm).
- D. Complete fabrication, including assembly, 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.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- 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.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.5 PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.
- B. Grade: Custom.
- C. AWI Type of Cabinet Construction: Flush overlay without on face frame.
- D. Cladding for Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Body members - ends, bottom, divisions, rails and tops: .028" exterior laminate over 3/4 inch thick MDF, interior Thermoset Decorative Overlay (melamine) with 3 mm PVC edging, all exposed and semi-exposed sides.
 - 2. Shelves: 3/4 inch thick MDF, Thermoset Decorative Overlay (melamine) each side with 3 mm PVC edging. Provide laminate over plywood where shelf widths are required to meet AWI 400-G-8.
 - 3. Backs: 1/4 inch thick MDF, Thermoset Decorative Overlay (melamine) each side.
 - 4. Drawer sides, backs and sub-fronts: 1/2" hardwood plywood or solid lumber.



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5. Drawer Bottoms: 1/4" hardwood plywood.
6. Drawer Fronts: .028" exterior laminate over 3/4 inch thick MDF, interior Thermoset Decorative Overlay (melamine) with 3 mm PVC edging.
7. Pre-manufactured drawer systems: Drawer systems will be acceptable similar to Blum Metabox or approved equal.
8. Cabinet Doors: .028" exterior laminate over 3/4 inch thick MDF, interior Thermoset Decorative Overlay (melamine) with 3 mm PVC edging.
9. Edging: Band all exposed edges with 3 mm PVC.
10. Base Toe Kick: 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. Provide Architect's selections from laminate manufacturer's full range of colors and finishes in the following categories:
 - a. Solid colors.
 - b. Patterns.
 2. Allow for 2 color selections.
- F. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.6 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.
- B. Grade: Premium.
- C. High-Pressure Decorative Laminate Grade: HGS, nominal thickness .048" (1.2 mm).
- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Provide Architect's selections from manufacturer's full range of colors and finishes in the following categories:
 - a. Solid colors.
 - b. Patterns.
 2. Allow for 2 color selections.
- E. Grain Direction: Parallel to cabinet fronts.
- F. Edge Treatment: As indicated on the drawings.
- G. Core Material: Medium Density Fiberboard.
- H. Core Material at Sinks: Medium Density Fiberboard.

2.7 SHOP FINISHING

- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.



1. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Reviewed for Code Compliance
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only final touchup, cleaning, and polishing until after installation.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.
- D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:
 1. Grade: Custom.
 2. AWI Finish System TR-5: Catalyzed vinyl.
 3. Staining: None required.
 4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 5. Sheen: Satin, 30-50 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- D. 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 for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.



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- E. 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).
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. 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.
 2. Secure backsplashes to tops.
 3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

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 semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

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SECTION 071150

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cold-applied, emulsified-asphalt dampproofing applied to the following surfaces:
 - 1. Exterior, below-grade surfaces of concrete foundation walls.
 - 2. Top of footing under foundation wall, extend beyond foundation wall

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

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. Cold-Applied, Emulsified-Asphalt Dampproofing:
 - a. Euclid
 - b. Karnak Corporation.



- c. Meadows, W. R., Inc.
- d. Sonneborn, Div. of ChemRex, Inc.

2.2 BITUMINOUS DAMPPROOFING

- A. Trowel Grade: ASTM D 1227, Type II, Class 1 or Type IV.
 - 1. Available Products:
 - a. Sealmastic, Type 3; W. R. Meadows
 - b. Hydrocide 700; Sonneborn Building Products.
 - c. Dampproofing Asphalt Coatings Mastic; Euclid
 - d. Karnak 920 AF; Karnac Chemical Corp.
- B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1 or Type IV.
 - 1. Available Products:
 - a. Sealmastic, Type 2; W. R. Meadows
 - b. Hydrocide 700B; Sonneborn Building Products.
 - c. Dampproofing Asphalt Coatings Semimastic; Euclid
 - d. Karnak 220 AF; Karnac Chemical Corp.
- C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
 - 1. Available Products:
 - a. Sealmastic, Type 1; W. R. Meadows
 - b. Hydrocide 600; Sonneborn Building Products.
 - c. Karnak 100 AF; Karnac Chemical Corp.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
 - 1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.3 APPLICATION, GENERAL



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- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated.
 - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
- B. Apply dampproofing to footings and foundation walls.
 - 1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing.
 - 2. Apply across top of footing, and between footing and base of foundation wall as indicated on the drawings.
 - 3. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat, one fibered brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m), or one trowel coat at not less than 4 gal./100 sq. ft. (1.6 L/sq. m).

3.5 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

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SECTION 07 21 00

THERMAL AND ACOUSTIC INSULATION

All work and materials shall conform to the Contract Documents and the provisions of the State of Maine Department of Transportation Standard Specifications, Revision November 2014, with the following additions:

Add the following:

PART 1 - GENERAL

- 1.01 GENERAL CONDITIONS: The General Conditions, Supplementary General Conditions and all Sections of Division 1 shall apply to each and every contract and contractor, person or persons supplying material, labor or entering into the work directly or indirectly.
- 1.02 SUMMARY:
- A. This Section includes the following:
 - 1. Foam-plastic board insulation.
 - 2. Foil-faced polyisocyanurate board insulation.
 - 3. Damp-blown cellulosic insulation
 - 4. Sprayed foam insulation.
 - 5. Mineral fiber batt insulation.
 - B. Related Sections include the following:
 - 1. Division 09 21 16 Gypsum Board Assemblies for insulation specified in that Section.
- 1.03 DEFINITIONS:
- A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.
- 1.04 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.
- 1.05 QUALITY ASSURANCE:
- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
 - 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.



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2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.06 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

2.01 MANUFACTURERS:

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

2.02 FOAM-PLASTIC BOARD INSULATION:

- A. Rigid Insulation: Extruded-Polystyrene Board Insulation; ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
 1. Available Products:
 - a. Foamular 250; Owens Corning.
 - b. Styrofoam by Dow Chemical Co.
 - c. Amofom-CM by Tenneco Building Products
 2. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.
 3. Application: Foundation insulation. Rigid insulation below concrete slab-on-grade.

2.03 FOIL-FACED POLISOCYANURATE BOARD INSULATION:

- A. Rigid Insulation: Foil-faced Polyisocyanurate Board Insulation; ASTM C 1289, Type I, Class 1 or 2, with maximum flame-spread and smoke-development indexes of 75 and 450, respectively, based on tests performed on unfaced core o thickness up to 4" (101 mm):
 1. Thickness: As indicated on drawings.
 2. R value: 6/IN.
 3. Provide manufacturer's sealing tape at all joints
 4. Available Products:
 - a. Atlas Roofing Corporation
 - b. Dow Chemical Co.
 - c. Rmax, Inc.
 5. Application: Exterior walls, under siding.



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2.04 DAMP SPRAY-APPLIED CELLULOSIC INSULATION:

- A. Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C 739, chemically treated for flame-resistance, processing, and handling characteristics, sprayed-in-place to a density of 3.0 to 3.5 lbs per cubic foot.
 - 1. Available Products:
 - d. Nu-Wool WallSeal Cellulose Insulation.
 - e. Cocoon2 Stabilized Borate Formula Insulation, product no. INS735.
 - 2. Application: Exterior wall assembly insulation.

2.05 SPRAYED FOAM INSULATION

- A. Sprayed Polyurethane Foam Sealant for Perimeter of Doors and Windows: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
 - 1. Available Products:
 - a. Great Stuff Window & Door by Dow
 - b. Froth-Pak by Insta-Foam Products, Inc.
 - c. Pur-Fill 1G by Todol Products, Inc.
 - d. Handi-Seal Window and Door Sealant by Fomo Products, Inc.
 - 2. Application: Perimeter wall air infiltration sealant.

2.06 MINERAL FIBER BATT INSULATION

- A. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Application: Sound proofing for shaft-walls.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Clean substrates of substances harmful to insulation or of interfering with insulation attachment.

3.03 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, rain, and snow.
- C. Extend insulation in thickness indicated to envelope 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 within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.



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- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.04 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not otherwise indicated, extend insulation to top of footing.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.
- D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted. Delete paragraph and subparagraphs below if no cellular-glass insulation.

3.05 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 foam-plastic 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. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
 - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - 5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- D. Place loose-fill insulation into spaces indicated, by machine blowing, to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
- E. Apply foamed-in-place insulation, by spray or froth method to a uniform monolithic density without voids into miscellaneous voids and cavity spaces where shown.

3.06 PROTECTION:

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



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PART 4 - MEASUREMENT AND PAYMENT:

4.01 METHOD OF MEASUREMENT:

Thermal and Acoustic Insulation will be measured by the lump sum, complete and accepted. The Thermal and Acoustic Insulation limits shall be as shown or described in the Contract Documents.

4.02 BASIS OF PAYMENT:

Thermal and Acoustic Insulation will be paid for at the contract lump sum price. Payment for Thermal and Acoustic Insulation will be under:

<u>Pay Item</u>	<u>Pay Unit</u>
DIV. 7 Thermal and Moisture	Lump Sum

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SECTION 07 27 00

AIR INFILTRATION BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Air infiltration barrier.
 2. Air and water barrier.
 3. Air Barrier Tape.
 4. Sill-Sealer Gaskets.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Submit shop drawings indicating details of construction, including expansion and control joints. Include relationship with adjacent materials, sequence of installation and materials and methods for sealing penetrations. At a minimum, shop drawings shall include details of the following connections, as applicable to the project:
1. Foundation and walls.
 2. Walls and windows or doors.
 3. Different wall systems.
 4. Wall and roof.
 5. Wall and roof over unconditioned space.
 6. Walls, floor and roof across construct, control and expansion joints.
 7. Wall, floor and roof to utility, pipe and duct penetrations.
- C. Samples for Verification: 12 inch (300 mm) square units for each type of air barriers indicated.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm experienced in applying air and water barrier materials 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. Preinstallation Conference: Before installing air and water barrier system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination." Notify participants at least 5 working days before conference.
1. Meet with Owner; Architect; air and water barrier installer and installers whose work interfaces with or affects air and water barrier.
 2. Review of approved submittals.
 3. Review methods and procedures related to air and water barrier installation, including manufacturer's written instructions.



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4. Schedule for subsequent work covering air and water barrier.
5. Procedures for quality assurance.
6. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect 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.

1.5 PROJECT CONDITIONS

- A. Separate and recycle waste materials.
- B. Apply air barriers within range of ambient and substrate temperatures recommended by air/vapor barrier manufacturer. Do not apply air barriers to a damp or wet substrate, unless the manufacturer specifically permits that for the product.
 1. Do not apply air barriers in snow, rain, fog, or mist.
 2. Do not apply air barriers when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

PART 2 - GENERAL

2.1 AIR INFILTRATION BARRIER MATERIALS

- A. Air-Infiltration Barrier: Contractor has the option of providing any of the following proprietary building wrap with flame-spread and smoke-developed ratings of less than 25 and 450, respectively, when tested according to ASTM E 84. Provide one of the products or approved equal:
 1. Polyolefin coated cross woven polyolefin scrim with filaments that form channels to allow for drainage of bulk moisture; 0.015 inch thick - ASTM D 1777; average weight 19 pounds per 1,000 SF – ASTM D 3776; water resistance >60min – ASTM D 779; water vapor permeance 10 perms – ASTM E 96, Procedure A; water vapor transmission rate 73g/sq.m/24HR – ASTM E 96; tensile strength MD 56lb/in, CD 30lb/in – ASTM D 882; burst strength 155 psi – ASTM D 751; flame spread / smoke developed ASTM 84: Class A-0/15
 - a. Product: Subject to compliance with requirements, provide "GreenGuard® RainDrop HouseWrap" by Pactiv Building Products.
- B. Auxiliary Materials:
 1. Sheet Membrane Flashing and Transitions Strips: 40 mil thick, self-adhering membrane as recommended by the manufacturer.
 2. Termination Bars: Stainless steel bar and fasteners as recommended by the manufacturer.



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2.2 ACCESSORIES

- A. Air Barrier Tape: Pressure-sensitive plastic tape recommended by air barrier manufacturer for sealing joints and penetrations in air barrier.
- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

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 air barriers, including removing projections capable of puncturing air barriers, or of interfering with attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions applicable to products and application indicated.
- B. Extend air barriers in thickness indicated to envelop entire area to be covered. Cut and fit tightly around obstructions. Remove projections that interfere with placement.

3.4 AIR-INFILTRATION BARRIER APPLICATION

- A. Cover wall sheathing with air barrier as indicated.
 - 1. Comply with manufacturer's written instructions.
 - 2. Cover upstanding flashing with 4-inch overlap.
 - 3. Seal seams, edges, and penetrations with tape.
 - 4. Extend into jambs of openings and seal corners with tape.

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SECTION 07 46 00
SOLID VINYL SIDING AND ACCESSORIES

1. GENERAL
 - 1.01 GENERAL CONDITIONS The General Conditions, Supplementary General Conditions and all Sections of Division 1 shall apply to each and every contract and contractor, person or persons supplying material, labor or entering into the work directly or indirectly.
 - 1.02 SCOPE This section includes all labor, materials, equipment and related services necessary for the fabrication, delivery and installation of the work shown on the drawings and/or herein specified, including but not limited to the following:
 - A. Vinyl siding and soffits
 - B. Vinyl accessories
 - 1.03 RELATED WORK SPECIFIED ELSEWHERE
 - A. Sealants 07 92 00
 - B. Air Infiltration Barrier 07 27 00
 - 1.04 REFERENCES: All siding and related accessories must meet or exceed Federal Specification PS 55-72 Rigid Poly Vinyl Chloride (PVC) plastic siding.
 - A. Submit full range of samples of vinyl and aluminum for color selection by the Architect.
 - 1.05 SUBMITTALS:
 - A. Samples of the following materials shall be furnished in the sizes and quantities listed: 1 linear foot of vertical siding, horizontal siding (clapboards) soffit panel vented and soffit panel non-vented.
 - B. Accessories: One each - starter strip, finish trim, outside corner post, J channels, inside corner post, "super" channel or any other specialty items associated with particular manufacturer's brand enclosed. All accessories must match panel finish.
 - C. Submit four copies of manufacturer's printed application manual and two unlocking tools to the Owner.
 - D. Metal coverings: 1 linear foot each after forming - fascia, fascia corner, window and door trim, window sill cap flashing, and related metal covering components.
 - 1.06 WARRANTIES: Provide a manufacturer's written 40 year non-prorated, limited fully transferable warranty. The warranty will not apply to any failures, defects or damages resulting from or connected with the following: misuse, impact of foreign objects, fire, hurricane, tornados, or other violent storm or casually, or acts of God, structural movement, or if painted. The installer shall guarantee the workmanship for a period of 1 year.



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1.07 DELIVERY AND STORAGE: Deliver materials to site in undamaged condition. Stack siding off ground and protect in a manner to prevent damage from exposure to the elements and construction operations.

2. PRODUCTS

2.01 SOLID VINYL SIDING

- A. All siding and related accessories shall be the product of one manufacturer, and shall be in production at the time of the installation. Product shall be of powder formulation, high impact resistant, rigid poly vinyl chloride plastic, minimum of 0.040, with average thickness of .045", and average weight per square of 45 lbs. Siding shall conform to PS-55. Provide one color siding for the project.
- B. Trim shall be textured to match siding.
- C. Nails shall be corrosion resistant metal with 1/8" diameter shank and 5/16" head, 1-1/2 to 2" long.
- D. Acceptable Manufacturers:
1. "Main Street No. 171" by Certain Teed
Profile: Double 4" shiplap
Texture: Wood grain
 2. Equivalent products must match design, color range, detail and finish of specified manufacturer's in order to be considered by the Architect.

3. EXECUTION

3.01 VINYL SIDING: Apply new vinyl siding in accordance with manufacturer's printed instructions, except as specified otherwise herein. The vinyl siding shall be installed by workmen experienced in the application of vinyl siding.

- A. No siding work shall be done in severe cold weather. Temperature must be a minimum of 20°F and rising. In no case will siding installation be allowed between December 24 and March 1.
- B. All top courses will be crimped both in and out every 8".
- C. Siding shall be at nailed 16" centers through the nailing slots. In order to provide for expansion and contraction of siding, nails shall be driven through the center of nail slots and shall not be driven tight against nailing lick. No face nailing of siding allowed.
- D. Vertical siding shall be installed in full length pieces with no end laps or butt joints permitted.
- E. Start installing the siding panels at back of the building and work toward the front, overlapping the panels toward the entrance ways and lapping the field cuts under factory ends to create the best appearance. End joints shall be staggered.
- F. Caulk joints where J-trim butts window and door trim, and at all other locations where a through joint occurs.
- G. When nailing, screwing, or bolting anything to finish vinyl, drill oversize holes so as not to restrict the vinyl.
- H. Random sampling will be done to ascertain adherence to Architect's specifications, manufacturer's specifications and accepted standards. If found not conforming, entire work may be rejected.
- I. Close tops of outside corner posts where exposed.

- J. Furnish 200 square feet of each type and color siding to the Owner for use in future repair work.



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SECTION 07 53 23

ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING



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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Adhered EPDM membrane roofing system.
 - 2. Roof insulation.
- B. Related Sections:
 - 1. Division 01 Section "Alternates" for alternates related to this section.
 - 2. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 3. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
 - 4. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

- 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 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind speed of 100 mph (measured 30 feet above the ground).
- D. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.



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1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Base flashings and membrane terminations.
 - 2. Tapered insulation, including slopes.
 - 3. Insulation fastening patterns for corner, perimeter, and field-of-roof areas.
- C. Samples for Verification: For the following products, in manufacturer's standard sizes:
 - 1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
 - 2. Roof insulation.
 - 3. Six insulation fasteners of each type, length, and finish.
 - 4. Six roof cover fasteners of each type, length, and finish.
- D. Qualification Data: For qualified Installer and manufacturer.
- E. Manufacturer Certificate: Signed by roofing manufacturer certifying that membrane roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of complying with performance requirements.
- F. Manufacturer's installation rating of the roofing contractor.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.
- H. Maintenance Data: For membrane roofing system to include in maintenance manuals.
- I. Warranties: Sample of special warranties.
- J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is FM Approvals approved for membrane roofing system identical to that used for this Project.
- B. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product. Contractor shall have installed a minimum of 500,000 square feet and have a manufacturer's installation rating of 9.0 or better.
 - 1. Installer for GAF products shall be a Master Select or Master Certified Contractor.
 - 2. Work associated with single-ply membrane roofing, including (but not limited to) insulation, flashing, and membrane sheet joint sealers, shall be performed by Installer of this Work.



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- C. Source Limitations: Obtain components including roof insulation and fasteners Insert products for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
 - D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
 - E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - F. Preliminary Roofing Conference: Before starting roofing installation, conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements for deck substrate conditions and finishes, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.
 - G. Upon completion of the installation, an inspection shall be made by the system manufacturer to ascertain that the roofing system has been installed according to the applicable manufacturer's specifications and details. No "early bird" warranty will be accepted. The results of the warranty inspection shall be submitted in writing to Owner for their review and records.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
 - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.



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- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. A manufacturer's sole source 15-year written Roofing System Warranty shall be provided with a peak gust wind speed limitation of 100 mph (measured 30 feet above the ground). Warranty shall cover both labor and materials with no dollar limitation and shall state that the Total roofing System will remain in a watertight condition. The contractor shall provide as part of the shop drawing submittal process, certification indicating that the manufacturer has reviewed and has agreed to such wind coverage indicated.
 - 1. Roofing System is defined as the following materials and provided by the roof system manufacturer: membrane, flashings, counterflashings, adhesives, sealants, insulation, overlayment, fasteners, fastener plates, fastener strips, hard rubber, metal edging. Metal termination anchor bars, roof drain flashing and sealants, and any other product utilized in this system installation.
 - 2. The warranty shall be for fifteen (15) years starting after final acceptance of the total roofing system by the roof system manufacturer. Defective materials or installation shall be removed, properly disposed of, and replaced at the manufacturer's expense.
 - 3. The warranty shall provide that if within the warranty period the roofing system becomes non-watertight or if the elastomeric sheet splits, tears, or separates at the seams because of defective materials and/or materials and cost thereof shall be the responsibility of the manufacturer. Should the manufacturer or his approve applicator fail to perform repairs within 72 hours of notification, the warranty will not be voided because of work being performed by others to repair the roofing regardless of the manufacturer's warranty to the contrary.
 - 4. The Roofing System shall be applied by a roofing Contractor approved by the system manufacturer. After inspection and acceptance of the installed roof system, the warranty will be issued.
 - 5. Submit an Extended Wind Speed Request Form for acceptance of 85 mph wind warranty prior to start of work. Notify Architect if request form is rejected from the manufacturer.



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PART 2 - PRODUCTS

2.1 EPDM MEMBRANE ROOFING

- A. EPDM: ASTM D 4637, Type I, non-reinforced, uniform, flexible EPDM sheet.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle SynTec Incorporated.
 - b. Firestone Building Products.
 - c. GAF Materials Corporation.
 - d. Versico Incorporated.
 2. Thickness: 60 mils, nominal.
 3. Exposed Face Color: Black.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesive: 80 g/L.
 - f. Single-Ply Roof Membrane Sealants: 450 g/L.
 - g. Nonmembrane Roof Sealants: 300 g/L.
 - h. Sealant Primers for Nonporous Substrates: 250 g/L.
 - i. Sealant Primers for Porous Substrates: 775 g/L.
 - j. Other Adhesives and Sealants: 250 g/L.
- B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.
- C. Protection Sheet: Epichlorohydrin or neoprene non-reinforced flexible sheet, 55- to 60-mil-thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
- D. Bonding Adhesive: Manufacturer's standard.
- E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch- wide minimum, butyl splice tape with release film.
- F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
- G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.



- H. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

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2.3 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by EPDM membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 1. Thickness: Provide a minimum of two (2) layers of insulation, with joints staggered, resulting in the total thickness shown, unless indicated otherwise.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation[**and cover boards**] to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: DOC PS 2, Exposure 1, OSB, 7/16 inch (11 mm) thick.

2.5 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck according to manufacturer's recommendations.
 - 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.4 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.



- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit to within 1/4 inch of nailers, projections, and penetrations.
- G. Loosely Laid Insulation: Loosely lay insulation units over substrate.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together.
 - 1. Fasten cover boards according to requirements of manufacturer's warranty.

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3.5 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhered membrane roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow it to relax before installing.
- B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.
- D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.
- E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- F. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.
- G. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- H. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.



- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

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3.7 WALKWAY INSTALLATION

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

3.8 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - 1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.
- B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

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SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes sheet metal flashing and trim in the following categories:
 - 1. Exposed trim, gravel stops, and fasciae.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
 - 2. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - 3. Division 7 Section "Joint Sealants" for elastomeric sealants.
 - 4. Division 7 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.
- B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:
 - 1. Wind Zone 2: Wind pressures of 31 to 45 psf.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.
- C. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
 - 1. 8-inch- square Samples of specified sheet materials to be exposed as finished surfaces.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.



1.5 PROJECT CONDITIONS

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

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PART 2 - PRODUCTS

2.1 METALS

- A. 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. Exposed Coil-Coated Finishes:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Provide finish color on both sides of sheet where shown.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. 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.
1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- B. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.
- C. Mastic Sealant: As specified in Division 7 Section "Joint Sealants".
- D. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."
- E. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- F. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
- G. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.



2.3 FABRICATION, GENERAL

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
1. Conform to referenced details of SMACNA's "Architectural Sheet Metal Manual" – 5th Edition.
- B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
- D. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- E. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
- H. Conceal fasteners and expansion provisions where possible.
- I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

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2.4 SHEET METAL FABRICATIONS

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.
- B. Metal Fasciae: Fabricate from the following material:
1. Aluminum: 0.032 inch thick.
2. Conform to drawings and applicable SMACNA details.



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.
- D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- E. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
- F. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams.
- G. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
 - 2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.



3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal, or deterioration of finishes.
- B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

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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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Silicone joint sealants.
- 2. Latex joint sealants.

B. Related Sections:

- 1. Division 08 Section "Glazing" for glazing sealants.
- 2. Division 09 Section "Gypsum Board" for sealing perimeter joints.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.

- B. Samples for Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

- C. Joint-Sealant Schedule: Include the following information:

- 1. Joint-sealant application, joint location, and designation.
- 2. Joint-sealant manufacturer and product name.
- 3. Joint-sealant formulation.
- 4. Joint-sealant color.

- D. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

- F. Warranties: Sample of special warranties.



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1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 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.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.



2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. **VOC Content of Interior Sealants:** Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. **Stain-Test-Response Characteristics:** Where 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.
- D. **Colors of Exposed Joint Sealants:** As selected by Architect from manufacturer's full range.

2.2 LEED REQUIREMENTS

- A. For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits, corresponding to an effective date of July 1, 2005 and rule amendment date of January 7, 2005. For aerosol adhesives, comply with Greenseal Standard 36 (GS-36) VOC Limits. Aerosol adhesives should meet Green Seal Standard GS36 Green Seal Standard for Commercial adhesives in effect on October 19, 2000.

2.3 SILICONE JOINT SEALANTS

- A. **Sealant Type 1:** Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant; ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790 (VOC 43); 756 SMS (VOC 87) for cold applications.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.



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- c. Pecora Corporation; 890 (VOC na).
- d. Sika Corporation, Construction Products Division; SikaSil-C990.
- e. Tremco Incorporated; Spectrem 1 (VOC 1).

B. Sealant Type 2: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant; ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 756 SMS (VOC 87).
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700 (VOC 27).
 - c. Pecora Corporation; 890NST (VOC 98).

C. Sealant Type 3: Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant; ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790 (VOC 43).
 - b. Pecora Corporation; 301 NS (VOC 50).
 - c. Tremco Incorporated; Spectrem 800 (VOC 1).

D. Sealant Type 4: Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant; ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 786(VOC 33) (Food)
 - b. GE Advanced Materials - Silicones; Sanitary SCS1700.
 - c. Tremco Incorporated; Tremsil 200 Sanitary (VOC 1).

2.4 LATEX JOINT SEALANTS

A. Sealant Type 5: Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Sonolac (VOC 41).
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. Pecora Corporation; AC-20 (VOC 31).
 - d. Tremco Incorporated; Tremflex 834.



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2.5 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material 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), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. 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. Provide self-adhesive tape where applicable.

2.6 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.



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2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.

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

3.3 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. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.



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- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

3.4 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.

3.5 PROTECTION

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



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3.6 JOINT-SEALANT SCHEDULE

- A. Exterior Isolation and Contraction Joints in Cast-in-place Concrete Slabs.
 - 1. Silicone Joint Sealant: Sealant Type 3.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- B. Exterior Control, Expansion, and Soft Joints in Masonry and Between Masonry and Adjacent Work.
 - 1. Silicone Joint Sealant: Sealant Type 1.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- C. Exterior Control, Expansion, and Soft Joints Between Masonry and Metal Door Frames, Windows, Storefronts and Curtain Walls.
 - 1. Silicone Joint Sealant: Sealant Type 1.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- D. Exterior Control, Expansion, and Soft Joints in Stone Work and Between Stone and Adjacent Work.
 - 1. Silicone Joint Sealant: Sealant Type 2.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- E. Under Exterior Door Thresholds.
 - 1. Silicone Joint Sealant: Sealant Type 1.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- F. Exterior Joints for Which No Other Sealant Type is Indicated.
 - 1. Silicone Joint Sealant: Sealant Type 1.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- G. Interior Isolation and Contraction Joints in Cast-In-Place Concrete Slabs.
 - 1. Silicone Joint Sealant: Sealant Type 3.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- H. Concealed Interior Perimeter Joints of Exterior Openings.
 - 1. Silicone Joint Sealant: Sealant Type 1.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- I. Exposed Interior Perimeter Joints of Exterior Openings.
 - 1. Silicone Joint Sealant: Sealant Type 1.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- J. Perimeter Joints Between Interior Wall Surfaces and Frames of Interior Doors Windows and Elevator Entrances.



1. Latex Joint Sealant: Sealant Type 5.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

K. Vertical Joints on Exposed Surfaces of Walls and Partitions.

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1. Latex Joint Sealant: Sealant Type 5.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

L. Joints between Plumbing Fixtures and Walls and Floors and Between Countertops and Walls.

1. Silicone Joint Sealant: Sealant Type 4.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

M. Interior Joints for Which No Other Sealant is Indicated.

1. Latex Joint Sealant: Sealant Type 5.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

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SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Standard hollow metal doors and frames.
- 2. Stile and rail hollow metal doors.

B. Related Sections:

- 1. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
- 2. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

- A. General: Submittals for Sections 081113, 081416 and 087100 shall be made concurrently.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- C. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.



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7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

D. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

C. Fire-Rated, Borrowed-Light Frame 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 257 or UL 9. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

E. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1. Doors: Provide doors as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:

- a. Clear Width: 32 inches (815 mm) with door 90 degrees open.
- b. Maneuvering Clearances: Refer to Code for various side and approach clearances.
- c. Double-Leaf Doorways: Provide at least one leaf that meets the clear width and maneuvering clearances.
- d. Two Doors in Series: Provide a distance of four feet plus the width of any door swinging into the space between hinged or pivoted doors.

2. Notify Architect of details or specifications not conforming to code.

F. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
2. Review tie-in to air barrier system.



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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Standard Steel Doors and Frames:
 - a. Ceco Door Products; a United Dominion Company.
 - b. Curries Company.
 - c. de La Fontaine, Industries.
 - d. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.



- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
 - 1. Wipe Coat Galvanneal materials will not be considered acceptable.
- E. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Comply with requirements in Division 08 Section "Glazing."
- K. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

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2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.



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- b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 10.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 - 1) Locations: Exterior doors and interior doors where indicated.
 - c. Do not use composite wood and agrifiber products containing urea-formaldehyde resins. Additionally, the laminating adhesive used in fabrication of on-site and shop-applied composite wood and agrifiber assemblies must contain no added urea formaldehyde resins.
3. Vertical Edges for Single-Acting Doors: Beveled edge.
- a. Beveled Edge: 1/8 inch in 2 inches.
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
- 1. Level 2 (18 ga faces) and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
- 1. Level 2 (18 ga faces) and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
 - 2. Face Design: Flush or embossed as shown.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- 2.4 STANDARD HOLLOW METAL FRAMES
- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
- 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as face welded unless otherwise indicated.
 - 3. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.



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- C. Interior Frames: Fabricated from cold-rolled steel sheet, unless metallic-coated sheet is indicated.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as knocked down unless otherwise indicated.
 - 3. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
 - 4. Frames for Wood Doors: 0.053-inch- thick steel sheet.
 - 5. Frames for Borrowed Lights: 0.053-inch- thick steel sheet.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 LOUVERS

- A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.



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1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other, any angle.
3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.9 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 2. Glazed Lites: Factory cut openings in doors.
 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 4. Full hinge cut-outs for non-handed doors will not be acceptable.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.



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5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not allowed.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.



- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

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2.10 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

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.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.



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3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
- D. At exterior walls and masonry walls, coat inside of frame profile with bituminous coating to a thickness of 1/16 inch.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.



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7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

- a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
- b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
- c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
- d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

SANITATION OFFICE / CREW SPACE
109 District Road, Portland, ME

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SECTION 08 14 16

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Sections:
 - 1. Division 06 Section "Interior Finish Carpentry" for wood door frames.
 - 2. Division 08 Section "Glazing" for glass view panels in flush wood doors.
 - 3. Division 09 Section "Interior Painting" for field finishing of wood doors.

1.3 SUBMITTALS

- A. General: Submittals for Sections 08 11 13, 08 14 16 and 08 71 00 shall be made concurrently.
- B. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- C. 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-protection ratings for fire-rated doors.
- D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 and UL 10C.
 - 1. Include all requirements as part of the door construction per Category "A" guidelines."



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- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

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

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Eggers Industries; Architectural Door Division.
 - c. Marshfield Door Systems, Inc.: Signature Series.
 - d. Mohawk Flush Doors, Inc.
 - e. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- C. Particleboard-Core Doors:



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1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

D. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.
2. Provide doors with structural-composite-lumber cores instead of particleboard cores for the following doors:
 - a. Doors indicated to receive exit devices.
 - b. Doors where oversized glass lites exceed more than 40 percent of the door surface area.
 - c. Doors where louvers exceed more than 40 percent of the door surface area.

E. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

F. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Select white maple.
3. Cut: Plain sliced.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Exposed Vertical Edges: Solid stock of same species as faces.
8. Core: Particleboard except where structural composite lumber is required.
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
10. Adhesives: Type I per WDMA TM-6.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.



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1. Wood Species: Same species as door faces.
2. Profile: Flush, square shape.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

- B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
1. 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 with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors in factory.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.
- D. Factory Glazing: Provide glazing for all doors. Provide glass as specified in Division 08 Section "Glazing." Install fire-rated glass as required by the glazing manufacturer.

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 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.



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- 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 that 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 08 14 16

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SECTION 08 54 13
FIBERGLASS AWNING WINDOWS

PART 1 - GENERAL

1.01 SECTION INCLUDES: Fiberglass Casement / Awning window complete with hardware, glazing, mullion options including PTAC, weather strip, insect screen, grilles-between-the-glass, jamb extension, sheet rock return, j-channel, and standard or specified anchors, trim and attachments

1.02 SCOPE: This Section includes all labor, materials, equipment and related services necessary for the fabrication and delivery to the job site of the items shown on the drawings and/or specified herein, including but not limited to the following:

- A. Fiberglass awning windows.
 - 1. Include factory glazing of window units.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Glass and Glazing 08 80 00

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. C1036: Standard Specification for Flat Glass.
2. E90-09: Standard Test Method for Laboratory Measurement of airborne Sound Transmission Loss of Building Partitions and Elements.
3. E 283: Standard Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
4. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Door by Uniform Static Air Pressure Difference.
5. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
6. E 2190: Standard Specification for Insulating Glass Unit Performance Evaluation.
7. F 2090-10: Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms.

B. Insulating Glass Manufacturer's Alliance/Insulating Glass Certification Council (IGMA/IGCC).



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- C. American Architectural Manufacturer’s Association/Window and Door Manufacturer’s Association/Canadian Standards Association (AAMA/WDMA/CSA): (use appropriate specification depending on certification for each product type).
1. AAMA/WDMA/CSA 101/I.S.2/A440-08: North American Fenestration Standard/Specification for windows, doors, and skylights.
 2. AAMA 450-10: Voluntary Performance Rating Method for Mullled Fenestration Assemblies.
- D. Window and Door Manufacturer’s Association (WDMA): Hallmark Certification Program.
- E. American Architectural Manufacturer’s Association (AAMA): 624-10: Voluntary Specification, Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles.
- F. National Fenestration Rating Council (NFRC): 101: Procedures for Determining Fenestration Product Thermal Properties.

1.05 SYSTEM DESCRIPTION

A. Design and Performance Requirements:

Product	Air Tested to psf	Water Tested to psf	Design Pressure (DP)	Certification Rating	Max Overall Width		Max Overall Height	
					in	mm	in	mm
Integrity All Ultrex Case-ment	1.57	6	40	LC-PG40-C	27	(686)	71	(1803)
Integrity All Ultrex Case-ment	1.57	6	40	LC-PG40-C	35	(889)	34	(864)
Integrity All Ultrex Case-ment	1.57	6	40	LC-PG40-C	35	(889)	54	(1372)
Integrity All Ultrex Case-ment	1.57	6	40	LC-PG40-C	35	(889)	71	(1803)
Integrity All Ultrex Awning	1.57	6	40	LC-PG40-AP	48	(1219)	35	(889)
Integrity All Ultrex Swing-ing Window Picture	1.57	6	40	LC-PG40-FW	71	(1803)	71	(1803)



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1.06 SUBMITTALS

- A. Shop Drawings: Submit shop drawings under provision of Section 01 33 23.
- B. Product Data: Submit catalog data under provision of Section 01 33 23.
- C. Samples:
 - 1. Submit corner section under provision of section 01 33 23.
 - 2. Specified performance and design requirements under provisions of Section 01 33 23.
- D. Quality Control Submittals: Certificates: submit manufacturer's certification indicating compliance with specified performance and design requirement under provision of section 01 33 23.

1.07 QUALITY ASSURANCE

- A. Requirements: consult local code for IBC [International Building Code] and IRC [International Residential Code] adoption year and pertinent revisions for information on:
 - 1. Egress, emergency escape and rescue requirements.
 - 2. Basement window requirements.
 - 3. Windows fall prevention and/or window opening control device requirements.

1.08 DELIVERY

- A. Comply with provisions of Section 01 65 00.
- B. Deliver in original packaging and protect from weather.

1.09 STORAGE AND HANDLING

- A. Store window units in an upright position in a clean and dry storage area above ground to protect from weather under provision of Section 01 66 00.

1.07 WARRANTIES

The following limited warranty is subject to conditions and exclusions. There are certain conditions or applications over which Integrity has no control. Defect or problems as a result of such conditions or applications are not the responsibility of Integrity. For a more complete description of the Integrity limited warranty, refer to the complete and current warranty information is available at <http://www.marvin.com/support/warranty>.

- A. Clear insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of purchase.
- B. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.



PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

- A. Description: All Ultrex® Casement/Awning and related stationary or picture units as manufactured by Integrity Windows and Doors, Roanoke, Virginia.

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2.02 FRAME DESCRIPTION:

A. Interior:

1. Pultruded reinforced fiberglass (Ultrex®), 0.075"-0.077" (2mm) thick wall.
2. Frame depth: 3 3/32" (79mm).
3. Jamb Depth: 2" (51mm)
4. Frame Expander accessory is an insert kit shipped as ready-to-install.
5. Insert kit includes four fabricated frame expander components, including head-jamb, sill and both jamb components.
6. Included in both 1" and 3" frame expander options.

2.03 SASH DESCRIPTION

- A. Pultruded reinforced fiberglass (Ultrex®), 0.075"-0.077" (2mm) thick wall.
B. Composite sash thickness: 15/16" (24mm)

2.04 GLAZING

- A. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC when tested in accordance with ASTM E 2190. STC/OITC ratings are tested to the stated performance level in accordance with ASTM E 90-09.
- B. Glazing Method: 11/16" (17mm) insulating glass.
- C. Glass Type: Low E1, E2, E3, or E3/ERS air or Argon Gas.
- D. Glass Type Options: Obscure Glass or California Fire Glass (Annealed exterior and tempered interior glazing configuration).
- E. Glazing Seal: Silicone bead at exterior; interior has glazing boot inserted.
- F. Perimeter Spacer: Default color is mill finish (stainless). An optional black perimeter spacer color is available for all interior color selections.
- G. Glazing Option: STC/OITC upgrade.

2.05 MULLING

Standard Mulling

- A. Directional mull limits: 6 wide by 1 unit high; Rough Opening not to exceed 114" x 78" (2896mm x 1981mm).
- B. Directional mull limits: 5 units wide by 5 units high: Rough Opening not to exceed 96" x 96" (2438mm x 2438mm).

Reinforced Mulling

- A. Directional mull limits: 6 wide by 1 unit high; Rough Opening not to exceed 114" x 78" (2896mm x 1981mm).
- B. Directional mull limits: 5 units wide by 5 units high: Rough Opening not to exceed 96" x 96" (2438mm x 2438mm).



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2.06 PACKAGED TERMINAL AIR CONDITIONER (PTAC) MULLING

A. All Ultrex Casement frame profile for use with PTAC; Factory-mulled below an Integrity Swinging Picture Unit.

B. Mull configuration: 1 wide by 2 high; maximum Rough Opening 72" x 96" (1829mm x 2438mm).

C. Integrity Swinging Picture sizes to be standard sizes only.

1. Width Call Number: 40, 50, and 60.

2. Height Call Number: 40, 46, 50, 56, and 60.

D. PTAC and mulled assembly currently non-rated; non-certified for air, water and structure.

E. Height of PTAC window frame will accommodate all PTAC sizes.

1. Standard PTAC height: 19 1/4"; standard PTAC width to match upper unit width.

F. Color

1. Exterior: Stone White, Cashmere, Pebble Gray, Bronze, Evergreen, or Ebony.

2. Interior: Stone White, Bronze or Ebony (split finishes not available on Bronze and Ebony interior options)

G. PTAC grill/louver not ordered, stocked or installed by Integrity Windows and Doors.

1. Reliable Products Inc. is recommended as manufacturer – color match, fit, form, and functionality.

H. Maintain all current product attribute options except the following:

1. Interior accessories: sheetrock return, 3/4" receiver, jamb extension (all depths), and frame filler not available factory installed.

2. Exterior accessories: Flush fin not available.

2.07 FINISH

A. Exterior: Pultruded fiberglass

1. Factory baked on acrylic urethane.

2. Meets AAMA 624-10 requirements.

B. Interior: Pultruded fiberglass

1. Factory baked on acrylic urethane.

C. Color: Stone White exterior with Stone White interior, Pebble Gray exterior with Stone White interior, Bronze exterior with Stone White interior, Evergreen exterior with Stone White interior, Cashmere exterior with Stone White interior, Ebony exterior with Stone White interior. Bronze exterior with Bronze interior, Ebony exterior with Ebony interior. (Split finishes not available on Dark Interior options)



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2.08 HARDWARE

- A. Lock: Multipoint locking mechanism is actuated from a single point of operation. The lock mechanism is concealed with only the actuator handle and escutcheon being visible to the interior.
- B. Hinges: Concealed stainless steel track and injection molded shoe.
- C. Handle: Die cast detachable folding handle.
- D. Roto-gear Operator: E-Gard™ coated hinge arm and housing mechanism.
- E. Snubber: Pulls the sash tight to the frame and provides engagement to keep the sash in place under structural loads.
- F. Color: Applies to handle and locking hardware:
 - 1. Standard Color: Stone White on Stone White Interior, Oil Rubbed Bronze on Bronze interior, Matte Black on Ebony Interior.
 - 2. Optional Colors: Stone White, Almond Frost, Oil Rubbed Bronze, Satin Nickel, Bright Brass, Matte Black

2.09 WEATHER STRIP

- A. Primary weather strip is an extruded TPE foam filled bulb attached to all four sides of the frame by a kerf and provides seal between sash and frame.
- B. Secondary weather strip is an extruded TPE hollow bulb that attaches to a kerf in the sash and provides seal between sash and frame.
- C. Standard weather strip color: black.

2.10 JAMB EXTENSION

- A. Standard: 2" (51mm) jambs. Optional factory-installed jamb extension: 4 9/16" (116mm) and 6 9/16" (167mm).
- B. Available in Stone White, Bronze or Ebony. Default color will match the unit interior selection.
 - 1. Split finishes are not available for Dark Interior options.
 - 2. Stone White jamb extension is available for all interior color selections.

2.11 INSECT SCREEN (REMOVE FOR FIXED WINDOWS)

- A. Factory-installed screen
 - 1. Screen mesh, 18 by 16: Charcoal fiberglass.
- B. Aluminum frame finish: Stone White, Bronze, Ebony.



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2.12 ACCESSORIES AND TRIM

A. Exterior Casing:

1. Non-integral to the unit. Fastened to the exterior wall with barb and kerf.
2. 2" (51mm) Brick Mould available as a full surround or with sill nosing. NOT IN THIS PROJECT.
3. 3 1/2" (89mm) Flat Casing available as a full surround or with sill nosing. Also available with 1" (25mm) ranch style header and sill overhang. NOT IN THIS PROJECT.
4. Available colors: Stone White, Evergreen, Bronze, Pebble Gray, Cashmere, or Ebony.

B. Installation Accessories:

1. Factory-installed vinyl nailing fin/drip cap at head, sill and side jambs.
2. Installation brackets: Brackets for 4 9/16" (116mm); 6 9/16" (167mm) jambs.
3. Mullion kit: standard mullion kit for filed assembly of related units available in horizontal, vertical and 2-wide and/or 2-high configurations. Kit includes: Instruction, interior and exterior mull covers, mull plugs and brackets.
4. Sheet rock return
5. Available colors: Stone White, Bronze or Ebony. Default color will match unit interior selection. Stone White is available for all interior color selections.
6. J-channel
7. Available colors: Stone White, Pebble Gray, Cashmere, Evergreen, Bronze or Ebony
8. Flush fin
9. Available colors: Stone White, Pebble Gray, Cashmere, Evergreen, Bronze or Ebony
10. 3/4" (19mm) receiver
11. Available colors: Stone White, Bronze or Ebony. Default color will match unit interior selection. Stone White is available for all interior color selections.
12. Frame expander (1 inch or 3 inch options available)
 - a. Available colors: Stone White, Pebble Gray, Cashmere, Evergreen, Bronze or Ebony.



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PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Condition: Before installation, verify openings are plumb, square and of proper dimensions as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding,
- B. Acceptance of Condition: Beginning installation confirms acceptance of existing conditions.

3.02 INSTALLATION

- A. Comply with Section 01 73 00.
- B. Assemble and install window/door unit(s) according to manufacturer's instruction and reviewed shop drawing.
- C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 92 00 Joint Sealants. Do not use expansive foam sealant.
- D. Install accessory items as required.
- E. Use finish nails to apply wood trim and mouldings.

3.03 FIELD QUALITY CONTROL

- A. Remove visible labels and adhesive residue according to manufacturers' instruction
- B. Unless otherwise specified, air leakage resistance tests shall be conducted at a uniform static pressure of 75 Pa (~1.57 psf). The maximum allowable rate of air leakage shall not exceed 2.3 L/sm² (~0.45 cfm/ft²).
- C. Unless otherwise specified, water penetration resistance testing shall be conducted per AAMA 502 and ASTM E1105 at 2/3 of the fenestration products design pressure (DP) rating using "Procedure B" – cyclic static air pressure difference. Water penetration shall be defined in accordance with the test method(s) applied.

3.04 CLEANING

- A. Remove visible labels and adhesive residue according to manufacturer's instruction.
- B. Leave windows and glass in a clean condition. Final cleaning as required in Section 01 74 00.

3.05 PROTECTING INSTALLED CONSTRUCTION

- A. Comply with Section 07 76 00.
- B. Protecting windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

END OF SECTION 08 54 13

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - 2. Silencers for all door frames.
- B. Related Sections include the following:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
 - 2. Division 08 Section "Flush Wood Doors" for integral intumescent seals provided as part of fire-rated labeled assemblies.

1.3 SUBMITTALS

- A. General: Submittals for Sections 081113, 081416 and 087100 shall be made concurrently.
- B. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
 - 2. Details of interface of electrified door hardware and building safety and security systems.
 - 3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- D. Samples for Verification: Submit minimum 2-by-4-inch plate Samples of each type of finish required, except primed finish.
- E. Product Certificates: For electrified door hardware, signed by product manufacturer.
 - 1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks, latches and closers.



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- G. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
- H. Warranty: Special warranty specified in this Section.
- I. Other Action Submittals:
 - 1. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, 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: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
 - b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - c. 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.
 - d. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in Project construction schedule. Submit the final door hardware sets after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.
 - 2. Keying Schedule: The final keying schedule shall be prepared after consultation with the Owner.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.



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- 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.
1. Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
1. Door Hardware: Provide hardware as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
 - 3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 2. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf for not more than 3 seconds.
 - c. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
 - d. Thresholds: Not more than 1/2 inch high.
 3. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- E. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- F. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.



1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
- G. 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.
- H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
 1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 2. Review sequence of operation for each type of electrified door hardware.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review required testing, inspecting, and certifying procedures.

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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. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to access control system.
- C. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and door hardware.



- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Period: One year from date of Substantial Completion, except as follows:
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
 1. Two Hinges: For doors with heights up to 60 inches.
 2. Three Hinges: For doors with heights 61 to 90 inches.
 3. Four Hinges: For doors with heights 91 to 120 inches.
 4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Weight: Unless otherwise indicated, provide the following:
 1. Entrance Doors: Heavy-weight hinges.
 2. Doors with Closers: Antifriction-bearing hinges.
 3. Interior Doors: Antifriction-bearing hinges and standard-weight hinges as indicated.



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- D. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - 1. Exterior Hinges: Stainless steel, with stainless-steel pin.
 - 2. Interior Hinges: Steel, with steel pin.
 - 3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.
- E. Hinge Options: Where indicated in door hardware sets or on Drawings:
 - 1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging corridor doors with locks.
 - 2. Corners: Square.
- F. Electrified Functions for Hinges: Comply with the following:
 - 1. Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle.
 - 2. Available Products:
 - a. Marray TEF 2+4
 - b. Hager: ETW 4-1/2 x 4-1/2.
 - c. McKinney: TA2714-CC4.
- G. Fasteners: Comply with the following:
 - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 2. Wood Screws: For wood doors and frames.
 - 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 - 4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors and wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 HINGES

- A. Butts and Hinges: BHMA A156.1.
- B. Template Hinge Dimensions: BHMA A156.7.
- C. Available Manufacturers:
 - 1. Hager Companies (HAG).
 - 2. McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - 3. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
- D. The following is a guide for hinge size and type required for this project.

	Manufacturer	Interior:	Exterior
1-3/8" Doors up to 3'-0" wide	Stanley	F179-3 1/2"	
	Hager	1279-3 1/2"	
	McKinney	T2714-3 1/2"	
1-3/4" Doors up to 3'-0" wide	Stanley	FBB179-4 1/2"	FBB191-4 1/2"
	Hager	BB1279-4 1/2"	BB1191-4 1/2"
	McKinney	TA-TB2714-4 1/2"	TA-TB2314-4 1/2"
1-3/4" Doors over 3'-0" wide	Stanley	FBB168-4 1/2"	FBB199-4 1/2"
	Hager	BB1168-4 1/2"	BB1199-4 1/2"



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	McKinney	T4A-T4B3786-4 1/2"	T4A-T4B3386-4 1/2"
2-1/4" Doors	Stanley Hager McKinney		FBB199-5" BB1199-5" T4A-T4B3386-5"

2.4 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Electrified Locking Devices: BHMA A156.25.
- D. Lock Trim:
1. Levers: Cast.
 2. Escutcheons (Roses): Forged.
 3. Dummy Trim: Match lever lock trim and escutcheons.
- E. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Bored Locks: Minimum 1/2-inch latchbolt throw.
 2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 3. Deadbolts: Minimum 1-inch bolt throw.
- F. Rabbeted Meeting Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.
- G. Backset: 2-3/4 inches, unless otherwise indicated.
- H. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
1. Strikes for Bored Locks and Latches: BHMA A156.2.
 2. Strikes for Mortise Locks and Latches: BHMA A156.13.
 3. Strikes for Interconnected Locks and Latches: BHMA A156.12.
 4. Strikes for Auxiliary Deadlocks: BHMA A156.5.
 5. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 6. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 7. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.



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2.5 HEAVY DUTY CYLINDRICAL LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by:
 - 1. Mechanical Locks and Latches:
 - a. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
- B. Bored Locks: BHMA Grade 1; Series 4000.
 - 1. Provide one of the following manufacturers and designs:
 - a. Sargent: 10 Line
- C. Auxiliary Locks: BHMA Grade 1.
- D. Lock Trim: Comply with the following:
 - 1. Lockset Designs: Provide the lockset design designated below or, if sets are provided by another manufacturer, provide designs that match those designated:
 - a. Sargent: LL
- E. Lock Functions: Lock functions as indicated in the hardware schedule shall be as follows:

FUNCTION	SARGENT
(1) (utility)	04
(2) (office)	05
(3) (passage)	15
(4) (classroom)	37
(5) (entrance)	16
(6) (privacy)	65

2.6 DOOR BOLTS

- A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Half-Round Surface Bolts: Minimum 7/8-inch throw.
 - 2. Interlocking Surface Bolts: Minimum 15/16-inch throw.
 - 3. Fire-Rated Surface Bolts: Minimum 1-inch throw; listed and labeled for fire-rated doors.
 - 4. Dutch-Door Bolts: Minimum 3/4-inch throw.
 - 5. Mortise Flush Bolts: Minimum 3/4-inch throw.
- B. Dustproof Strikes: BHMA A156.16, Grade 1.

2.7 EXIT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
- B. Products: All exit devices for this project shall be one of the following:
 - 1. The 80 Series exit device by Sargent & Co.
- C. Exit Devices: BHMA A156.3, Grade 1.



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- D. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- E. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- F. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- G. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- H. Outside Trim: Pull with cylinder; material and finish to match locksets, unless otherwise indicated.
- I. The following functions shall be required where specified:

J. FUNCTION	VON DUPRIN	SARGENT	PRECISION
A	CD99NL-OP	16-8804	1103CD x 1123-38
B	CD99EO	16-8810	1101CD x 1123-38
C	99L	8813ET	1108 x 39L x 1123-38
D	99L-BE	8815ET	1108A x 39L x 1123-38
E	99EO-F	12-8810	FL-1101 x 1123-38
F	99L-F	12-8813ET	FL-1108 x 39L x 1123-38
G	99L-F-BE	12-8815ET	FL-1108A x 39L x 1123-38
H	CD9927EO	16-8710	1201CD x 1123-38
I	9927L	8713ET	1208 x 39L x 1123-38
J	9927L-BE	8715ET	1208A x 39L x 1123-38
K	CD9927EO x LBR	16-PP/PR8710	1201CD x 1123-38 x LBR
L	9927L x LBR	PP/PR8713ET	1208 x 39L x 1123-38 x LBR
M	9927L-BE x LBR	PP/PR8715ET	1208A x 39L x 1123-38 x LBR
N	9927EO-F	12-8710	FL-1201 x 1123-38
O	9927L-F	12-8713ET	FL-1208 x 39L x 1123-38
P	9927L-F-BE	12-8715ET	FL-1208A x 39L x 1123-38
Q	9927EO-F x LBR	12-PP/PR8710	FL-1201 x 1123-38 x LBR
R	9927L-F x LBR	12-PP/PR8713ET	FL-1208 x 39L x 1123-38 x LBR
S	9927-L-F-BE x LBR	12-PP/PR8715ET	FL-1208A x 39L x 1123-38 x LBR

2.8 LOCK CYLINDERS

- A. Lock Cylinders: Provide 7-Pin large format interchangeable core cylinder housings, no exceptions.



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- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Seven.
 - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cores: Match keyway of existing building.
- D. Cylinders
 - a. Match existing keyways.

2.9 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
 - 1. Master Key System: Cylinders are operated by a change key and a master key.
 - 2. Keyed Alike: Key all cylinders to same change key.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: Information to be furnished by Owner.
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.

2.10 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks. Deliver key cabinet to the BGS Lock Shop.
 - 1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
- B. Cross-Index System: Multiple-index system for recording key information. Include three receipt forms for each key-holding hook. Set up by key control manufacturer.
 - 1. Available Manufacturers:
 - a. Key Control Systems, Inc. (KCS).
 - b. Telkee, Inc.; a division of Sunroc Corporation (SUN).

2.11 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Materials: Fabricate from stainless steel, unless otherwise indicated.
- C. Available Manufacturers:



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1. Burns Manufacturing Incorporated (BM).
2. Don-Jo Mfg., Inc. (DJO).
3. Hager Companies (HAG).
4. IVES Hardware; an Ingersoll-Rand Company (IVS).
5. Rockwood Manufacturing Company (RM).

- D. Door Pulls, 3/4 inch diameter.
1. Size: ADA compliant, unless indicated otherwise, provide 5 5/8 inches center to center, with 1 7/8 inch projection and 1 3/8 inch clearance.
 2. Available Products:
 - a. Hager Companies, 8N.

2.12 CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Surface-Mounted Closers:
 - a. LCN Closers; an Ingersoll-Rand Company (LCN).
 - b. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
- C. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
1. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- D. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
- E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
1. LCN:
 - a. Exterior: 4040 Series
 - b. Interior: 4040 Series
 2. Sargent:
 - a. Exterior: 281
 - b. Interior: 281



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2.13 TRIM UNITS

- A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's standard machine or self-tapping screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:
 - 1. Material: 0.050-inch- thick stainless steel.
 - 2. Available Manufacturers:
 - a. Burns Manufacturing Incorporated (BM).
 - b. Don-Jo Mfg., Inc. (DJO).
 - c. Hager Companies (HAG).
 - d. IVES Hardware; an Ingersoll-Rand Company (IVS).
 - e. Rockwood Manufacturing Company (RM).
- D. Fabricate protection plates as follows:
 - 1. Push Plates: 16" high by 8" wide.
 - 2. Kick Plates: 10" high by 1-1/2" less than door width for single doors and 1" less than door width for pairs of doors. Kick plates shall be applied to push side of all doors where noted.

2.14 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
 - 1. Provide wall stops for doors unless floor or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
 - 2. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.
- B. Wall Stops: Wall type bumpers with concealed type flange shall be used wherever possible.
 - 1. Available Products:
 - a. Ives - 407 1/2
 - b. Door Controls - 3211T
 - c. Rockwood - 409
- C. Floor Stops: Where wall type bumpers cannot be used, provide dome type, floor mounted stops of the proper height as follows:
 - 1. Available Products:
 - a. Ives - 436, 438
 - b. Door Controls - 3310X, 3320X
 - c. Rockwood - 440, 442



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- D. Exterior doors striking masonry and doors specified to have door stops and holders, shall have cast bronze wall or floor type door stops with hook or staple type holders to selectively hold doors in open position. The following will be acceptable:
 - 1. Available Products:
 - a. Ives - 445, 446
 - b. Door Controls - 3237X, 3347X
 - c. Rockwood - 473, 477
- E. Door Catches: Provide surface-mounted roller catch where indicated. Ives No. 338 or approved substitute.
- F. Roller Bumper: Provide curved roller bumper with 2-3/4 inch projection with brushed chrome finish; No. GJRB3 by Robert Brooke and Associates, Hager 273W, or approved substitute.
- G. Silencers for Wood Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 5/8 by 3/4 inch; fabricated for drilled-in application to frame.
- H. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

2.15 DOOR GASKETING

- A. Standard: BHMA A156.22.
- B. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- C. Weatherstripping:
 - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Basis-of-Design Product, No. A626A by National Guard Products or approved substitute.
 - 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed. Basis-of-Design Product, No. 600A by National Guard Products or approved substitute.
 - 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed. Basis-of-Design Product, No. 95WH by National Guard Products or approved substitute.
- D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke-labeled gasketing on fire-rated doors and on smoke-labeled doors. Basis-of-Design Product, No. 5050 by National Guard Products or approved substitute.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.



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2.16 SILENCERS

- A. Provide rubber silencers for all interior pressed steel (hollow metal) frames. Silencers shall be pneumatic type 1/2" diameter with 1/8" projection.
- B. Provide 3 silencers for the strike jamb of metal frames for single doors and two for the head for metal frames for pairs of doors. Provide 4 silencers for the strike jamb for frames for single dutch doors.

2.17 THRESHOLDS

- A. Standard: BHMA A156.21.
- B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
 - 1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
- C. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch high.
- D. Manufacturers:
 - 1. Provide No. 896 with door bottom sweep No. 95WH by National Guard Products or approved substitute.
 - 2. Thresholds shall include thermal break feature.

2.18 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



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- of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Steel Machine or Wood Screws: For the following fire-rated applications:
 - a. Mortise hinges to doors.
 - b. Strike plates to frames.
 - c. Closers to doors and frames.
 3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - a. Surface hinges to doors.
 - b. Closers to doors and frames.
 - c. Surface-mounted exit devices.
 4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 5. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.19 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide the following finishes:
 1. Butts and Hinges: 26D
 2. Locks & Lock Trim: 26D
 3. Exit Devices: 26D
 4. Door Controls - Closers: Sprayed Aluminum Finish
 5. Door Stops: 26D
 6. Weatherstripping: Clear Anodized Aluminum
 7. Threshold: Clear Anodized Aluminum
 8. Kickplates: Brushed Stainless Steel
 9. Pulls: 26D

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.



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- 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 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 09 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. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- D. Strikes for Vertical Rod Exit Devices: Where vertical rod exit devices are used at interior doors, bottom strikes at floor are to be installed so that the top of the strike is flush with the adjacent flooring material.

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. 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 from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer shall examine and readjust, including adjusting operating forces, each item of door



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hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

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.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.7 DOOR HARDWARE SETS

- A. The hardware sets listed below indicate the items of hardware required for each opening. It is the bidder's responsibility to accurately furnish the proper quantities, items, sizes, weights and functions as required by the plans and specifications. If an opening has, through error, been omitted from the following hardware sets, it shall be the bidder's responsibility to supply hardware of equivalent quality and quantity, as that which is specified for a comparable opening.

HW1 - MAIN ENTRANCES

Doors 101.1, 108.1

Each leaf to have: Hinges / US32D
Closer
Rim Exit Device / Cast Lever Trim
Cylinder
Electric Strike
IEI Keypad
Transformer
Extruded Aluminum Threshold
Weatherstripping

HW2 - PRIVATE OFFICE

Doors 102.1, 103.1, 104.1, 105.1

Each leaf to have: Hinges
Heavy Duty Cylindrical Lockset Function (2) Office
Cylinder



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HW3 - UTILITY / STORAGE

Doors 110.1

Each leaf to have: Hinges
Heavy Duty Cylindrical Lockset Function (1) Utility
Cylinder

HW4 - PASSAGE SET

Doors 109.1

Each leaf to have: Hinges
Heavy Duty Cylindrical Locket Function (3) Passage

HW5 - PRIVACY SET

Doors 106.1, 107.1

Each leaf to have: Hinges
Passage Set Privacy Deadbolt

END OF SECTION 08 71 00



SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors and borrowed lite frames.
 - 2. Windows.
- B. Related Sections:
 - 1. Division 08 Section "Flush Wood Doors" for wood doors to be factory glazed.
 - 2. Division 08 Section "Hollow Metal Doors & Frames"

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.



- B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Product Certificates: For glass and glazing products, from manufacturer.

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1.6 QUALITY ASSURANCE

- A. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- C. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Glazing Manual."
- D. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- E. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.



1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 - a. Maximum U Value: 0.35
 3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - a. Minimum SHG Value: 0.35
 4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

- A. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.

2.3 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
 1. Sealing System: Dual seal, with silicone primary seal and butyl secondary seal.



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2. Spacer: Aluminum with mill or clear anodic finish.
3. Desiccant: Molecular sieve or silica gel, or blend of both.
4. Product: Pilkington "Energy Advantage" Hardcoat Low E
5. Include argon gas fill of interspace.
6. Provide low-e coating on Surface #2.

2.4 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies.
- B. Laminated Ceramic Glazing: Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite Plus.
 - b. Schott North America, Inc.; Laminated Pyran Crystal.
 - c. Vetrotech Saint-Gobain; SGG Keralite FR-L.

2.5 MIRRORING GLASS

- A. Silvered Mirrored Glass: Tempered float glass with successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard organic protective coating applied to second glass surface to produce a coating system complying with ASTM C1036 and CPSC 16 CFR 1201, 1/4 inch (6mm) thick.

2.6 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 1. EPDM complying with ASTM C 864.
 2. Silicone complying with ASTM C 1115.
 3. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.



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2.7 GLAZING SEALANTS

A. General:

1. **Compatibility:** Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. **Suitability:** Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. **VOC Content:** For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
4. **Colors of Exposed Glazing Sealants:** As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. May National Associates, Inc.; Bondaflex Sil 290.
 - d. Pecora Corporation; 890.
 - e. Sika Corporation, Construction Products Division; SikaSil-C990.
 - f. Tremco Incorporated; Spectrem 1.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.8 GLAZING TAPES

A. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.



- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

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2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.11 MONOLITHIC-GLASS TYPES

- A. Tempered Glass: Clear fully tempered float glass.
 - 1. Thickness: 6.0 mm.
 - 2. Provide safety glazing labeling.

2.12 INSULATING-GLASS TYPES

- A. Low-E Insulated Glass: Low-e-coated, clear insulating glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Thickness of Each Glass Lite: 6.0 mm.
 - 3. Outdoor Lite: Low-E glass.
 - 4. Interspace Content: Air.
 - 5. Indoor Lite: Float glass.
 - 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 7. Provide tempered glass and safety glazing labeling where required by code.
 - 8. Application: Exterior Fiberglass Windows



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.



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1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- 3.4 TAPE GLAZING
- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
 - B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
 - C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
 - D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
 - E. Do not remove release paper from tape until right before each glazing unit is installed.
 - F. Apply heel bead of elastomeric sealant.
 - G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
 - H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 MIRRORS

- A. Mastic Spot Installation System: Install mirrored glass units with mastic as follows:
 1. Apply barrier coat to mirrored glass backing where approved in writing by manufacturers of mirrored glass and backing material.
 2. Apply mastic in spots to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrored glass units and face of mounting surface.



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3. After mastic is applied, align mirrored glass units and press into place while maintaining a minimum air space of 1/8 inch (3 mm) between back of mirrored glass and mounting surface.

3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

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SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING



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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
 - a. Include neoprene isolation hangers for acoustic ceilings and soffits.
 - 3. Exterior furring systems (e.g., supports for fiber cement siding, etc.).
 - 4. Exterior suspension systems (e.g., supports for suspended soffits, etc.).
- B. Related Sections include the following:
 - 1. Division 07 Section "Thermal Insulation" for insulation installed with Z-shaped furring members.
 - 2. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.
 - 3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Framing and Furring:
 - a. Clark Western Building Systems, UltraSteel™ Framing.



- b. Dietrich Industries, Inc., UltraSteel™ Framing.
- c. MarinoWare; Division of Ware Ind.
- d. National Gypsum Company.
- e. The Steel Network, Inc.
- f. Unimast, Inc.

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized or equivalent per ASTM A1003.
- C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: As indicated on Drawings or not less than 0.032 inch (20 Ga.).
 - b. Depth: As indicated on Drawings.
 - 2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: As indicated on Drawings or not less than 0.032 inch (20 Ga.).
 - b. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
 - 2) Superior Metal Trim; Superior Flex Track System (SFT).
- E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:



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- a. Fire Trak Corp.; Fire Trak.
 - b. Metal-Lite, Inc.; The System.
 - c. The Steel Network, Inc.; VertiClip SLD or VertiTrack VTD.
 - d. Dietrich: SLP-TRK Slotted Track.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0312 inch.
- G. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
1. Depth: 1-1/2 inches.
 2. Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch- thick, galvanized steel or BridgeClip by The Steel Network, Inc.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0179 inch.
 2. Depth: As indicated on Drawings.
- I. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical.
- J. Masonry Furring Channels: Adjustable wall furring designed for use on brick or block with cold-rolled channel. Provide No. FCWB by Dietrich or approved substitute.
- K. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
1. Depth: 3/4 inch.
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.
- L. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
- 2.3 SUSPENSION SYSTEMS
- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
1. Depth: 1-1/2 inches.



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- E. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
 - 2. Steel Studs: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0179 inch.
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base Metal Thickness: 0.0179 inch.
 - 4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical.

- F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; 640-C Drywall Furring System.
 - c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.



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- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs as follows:
 - a. Single-Layer Construction: 16 inches o.c., unless otherwise indicated.
 - b. Multilayer Construction: 16 inches o.c., unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two 0.312 inch (0.79 mm) (20 gage) studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Z-Furring Members:



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1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

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- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

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SECTION 09 29 00GYPSUM BOARD



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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
 - 2. Acoustic sound attenuation batts.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
 - 2. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.



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- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Recycled Content: Minimum 95 percent.
- C. Provide product that is manufactured within 500 miles of project site.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. G-P Gypsum.
 - b. Lafarge North America Inc.
 - c. National Gypsum Company.
 - d. USG Corporation.
- B. Regular Type:
 - 1. Thickness: 5/8" inch.
 - 2. Long Edges: Tapered.
- C. Type X:
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
 - 3. Basis of design Product: "DensArmor Plus" as manufactured by G-P Gypsum.

2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material:
 - a. Galvanized or aluminum-coated steel sheet or rolled zinc.
 - b. Plastic where abutting exterior metal doors and windows.
 - 2. Shapes:



- a. Cornerbead.
- b. LC-Bead: J-shaped; exposed long flange receives joint compound.
- c. Expansion (control) joint.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Paper or 10-by-10 glass mesh.
 2. Mold-Resistant Gypsum Wallboard: 10-by-10 glass mesh.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
 - a. Use setting-type taping with mold-resistant gypsum wallboard.
 3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: Not required.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 2. Recycled Content: Provide blankets with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 20 percent by weight.
- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; AC-20 FTR or AIS-919.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.



2. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- F. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."
- G. Firestopping: As specified in Division 07 Section "Penetration Firestopping."

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.



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- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Fire-Resistance-Rated Gypsum Board Assemblies: Provide firestop system at the top of fire-resistance-rated gypsum board assemblies. Provide firestop system around any structural penetration of wall assembly.
- L. Smoke-Rated Gypsum Board Assemblies: Provide a tight, taped joint at the top of smoke-rated assemblies and around any penetrations to assemblies at both side of the assembly. The use of acoustical sealant will be acceptable to fill gaps up to 3/8 inch wide.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Regular Type: Vertical and ceiling surfaces, unless otherwise indicated.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Moisture- and Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to



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framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings or according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Where indicated on Drawings.
 3. Level 3: Where indicated on Drawings.
 4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
 5. Level 5: Not required.

3.6 FIELD QUALITY CONTROL



- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
1. Complete the following in areas to receive gypsum board ceilings:
 - a. Installation, insulation, and leak and pressure testing of water piping systems.
 - b. Installation of air-duct systems.
 - c. Installation of air devices.
 - d. Installation of mechanical system control-air tubing.
 - e. Installation of ceiling support framing.
 - f. Installation of Penetration Firestopping.
 - g. Implementation of all Airtight Drywall Approach procedures.

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3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

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SECTION 09 51 13

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 01 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.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Source Limitations:



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1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
2. Suspension System: Obtain each type through one source from a single manufacturer.

1.6 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
- 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 IBC.

1.7 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.

1.8 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.



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1.9 COORDINATION

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

1.10 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 25 percent by weight.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Where indicated, provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.



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2.2 ACOUSTICAL PANELS TYPE ACT-1

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.; Fine Fissured 1732.
 - 2. Provide unless otherwise noted.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 1, nodular or 2, water felted.
 - 2. Pattern: CE (perforated, small holes and lightly textured) and I (embossed).
- C. Color: White.
- D. LR: Not less than 0.85.
- E. NRC: Not less than 0.55.
- F. CAC: Not less than 35.
- G. Edge/Joint Detail: 15/16" Tegular.
- H. Thickness: 5/8 inch.
- I. Modular Size: 24 by 24 inches.
- J. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

2.3 ACOUSTICAL PANELS TYPE ACT-2

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.; Ceramaguard Fine Fissured Perforated 607.
 - 2. Intended Use: Wet areas, storage rooms, shower rooms
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 1, nodular or 2, water felted.
 - 2. Pattern: CE (perforated, small holes and lightly textured) and I (embossed).
- C. Color: White.
- D. LR: Not less than 0.82.
- E. NRC: Not less than 0.55.
- F. CAC: Not less than 38.



- G. Edge/Joint Detail: 15/16" Square lay-in.
- H. Thickness: 5/8 inch.
- I. Modular Size: 24 by 24 inches.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. 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.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- D. 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.
- E. 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- diameter wire.
- F. Hanger Rods or Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- H. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
 - 1. Available Product: UHDC by Armstrong or L15 by USG.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Prelude ML 15/16" Exposed Tee System; Armstrong World Industries, Inc.



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- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.
1. Structural Classification: Intermediate-duty system.
 2. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
 3. Face Design: Flat, flush.
 4. Cap Material: Steel cold-rolled sheet or aluminum.
 5. Cap Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

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."



1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

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1. Hangers shall be single lengths of wire without splices; coordinate lengths in deep ceiling cavities.
 2. 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.
 3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 4. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 5. 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.
 6. 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.
 7. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 8. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 9. 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.
 10. Do not attach hangers to steel deck tabs.
 11. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 12. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 13. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Suspension system shall be reinforced to support diffusers, light fixtures and any additional members. Install hanger wires to grid at each corner of light fixtures. Coordinate location with electrical and other trades.
1. Each individual fixture and attachment with combined weight of 56 pounds or less shall have two 12-gage wire hangers attached at diagonal corners of the fixture. These wires



shall be slack. Fixtures and attachments with a combined weight of greater than 56 pounds shall be independently supported from the structure at all four corners.

- E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area, and where necessary to conceal edges of acoustical panels.

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1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

- F. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

- G. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to long axis of space.
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. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
5. Install hold-down clips in areas within 10 feet of exterior doors or vestibule doors; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.

3.4 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs acoustical panel ceilings, conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of acoustical panels until deficiencies have been corrected.

1. Complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of penetration firestopping.



3.5 CLEANING

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

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SECTION 09 91 13

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Steel.
- B. This Section includes exposed exterior items and surfaces with low VOC coatings complying with ME DEP regulations.
- C. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
 - 3. Division 08 Sections for factory priming windows and doors with primers specified in this Section.
 - 4. Division 09 painting Sections for special-use coatings.
 - 5. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Selection: For each type of topcoat product.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. VOC content.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced Applicator who has completed painting system applications 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 primers and undercoat materials for each coating system from the same manufacturer as the finish coats.



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1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

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 the following:
 - 1. Benjamin Moore & Co.
 - 2. Sherwin Williams
 - 3. ICI Paints

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Compliance for Exterior Paints and Coatings: Provide the manufacturer's formulation for the products specified below that are VOC compliant with the State of Maine Department of Environmental Protection Regulation, "Chapter 151: Architectural and Industrial Maintenance (AIM) Coatings" and the following chemical restrictions expressed in grams per liter:
 - 1. Flat Paints and Coatings: VOC content of not more than 100 g/L.
 - 2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
 - 3. Non-Flat Paints and Coatings - High Gloss: VOC content of not more than 250 g/L.



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4. Anticorrosive (Rust Preventative) Coatings: VOC content of not more than 400 g/L.
5. Fire Resistive Coatings: VOC content of not more than 350 g/L.
6. Industrial Maintenance Coatings (IMC): VOC content of not more than 340 g/L.
7. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
8. Quick-Dry Enamels: VOC content of not more than 250 g/L.
9. Quick-Dry Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
10. Specialty Primers, Sealers, and Undercoaters: VOC content of not more than 350 g/L.
11. Wood Preservatives: VOC content of not more than 350 g/L.

- C. Colors: Provide color selections made by the Architect. Allow for up to 3 different color selections.

2.3 METAL PRIMERS

- A. Ferrous-Metal and Galvanized Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04.

2.4 EXTERIOR LATEX PAINTS

- A. Exterior Semi-Gloss Acrylic Enamel: Factory-formulated semi-gloss acrylic enamel for exterior application on metals.
1. Benjamin Moore; DTM Acrylic Semi-Gloss Enamel M29: Applied at a dry film thickness of not less than 2.0 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Wood: 15 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.



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- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Uniformly abrade galvanized surfaces with a palm sander and 60 grit aluminum oxide so surface is free of oil and surface contaminants.
- F. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Apply an additional coat of primer on metal surfaces that have been shop primed.
- B. Tinting: Tint primer of colors such as reds, yellows, and oranges with a gray basecoat system designed to help provide color coverage.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces. When using colors such as red, yellow or orange, an extra coat of finish may be necessary. Notify Architect when additional coats do not fix the problem.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.



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3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. VOC Compliance, General: Provide the manufacturers' formulations for the products specified below that comply with the VOC requirements for the State of Maine Department of Environmental Protection in paragraph 2.02.C of this Section.
- B. Steel Substrates: Provide the following finish systems over exterior ferrous metal including doors and frames. Primer is required on shop-primed items.
 - 1. Semi-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
 - a. Primer: Exterior ferrous-metal primer.
 - b. Finish Coats: Exterior semi-gloss acrylic enamel.

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SECTION 09 91 23

INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel.
 - 4. Wood.
 - 5. Gypsum board.
- B. This Section includes exposed interior items and surfaces with low VOC coatings complying with ME DEP regulations.
- C. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
 - 3. Division 08 Sections for factory priming windows and doors with primers specified in this Section.
 - 4. Division 09 painting Sections for special-use coatings.
 - 5. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
 - 6. Division 09 Section "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 SUBMITTALS

- A. Product List: For each product indicated, include the following:
 - 1. Product data.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.



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3. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 4. Include printed statement of VOC content for each product.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
1. Submit Samples on rigid backing, 8 inches square.
 2. Step coats on Samples to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced Applicator who has completed painting system applications 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, primers and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of general wall paint system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
 3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.



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1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

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 the following:
 - 1. Benjamin Moore & Co.
 - 2. Sherwin Williams
 - 3. ICI Paints

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - 1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 - 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 - 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.



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4. Floor Coatings: VOC not more than 100 g/L.
5. Shellacs, Clear: VOC not more than 730 g/L.
6. Shellacs, Pigmented: VOC not more than 550 g/L.
7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.



- D. Colors: Provide color selections made by the Architect. Allow for up to ten (10) different color selections. Each color may be specified in varying sheens for varying substrates.

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2.3 SOLVENT REQUIREMENTS: For applications that are inside of the weatherproofing system use:

- A. Paints, paint primers and coatings that comply with the following limits for VOC content limits of Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
- B. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC limit of 250 g/L as established in Green Seal Standard GS-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.
- C. Clear wood finishes, floor coatings, stains, and shellacs applied to interior elements must not exceed the South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules if effect January 1, 2004.

2.4 BLOCK FILLERS

- A. Latex Block Filler:
1. Moore: Latex Block Filler No. M88.

2.5 PRIMERS/SEALERS

- A. Low-VOC Latex Primer/Sealer:
1. Moore: Pristine Eco Spec Interior Latex Primer Sealer, No. 231
- B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.6 METAL PRIMERS

- A. Rust-Inhibitive Primer (Water Based):
1. Moore: IMC Acrylic Metal Primer M04. (51 g/L)

2.7 LATEX PAINTS

- A. Low-VOC Latex (Flat):
1. Moore: Pristine Eco Spec Interior Latex Flat, No. 219.
- B. Low-VOC Latex (Low Luster):
1. Moore: Pristine Eco Spec Interior Latex Eggshell, No. 223



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- C. Low-VOC Latex (Semigloss):
 - 1. Moore: Pristine Acrylic Semi-Gloss, No. 214

2.8 HIGH PERFORMANCE EPOXY PAINTS

- A. Waterborne Epoxy Finish:
 - 1. Moore: Moorcraft Super Spec Acrylic Epoxy Coating No. 256.

2.9 FLOOR COATINGS

- A. Latex Floor and Porch Paint (Low-Luster):
 - 1. Moore Latex Floor & Patio Enamel 122.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.



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- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Uniformly abrade galvanized surfaces with a palm sander and 60 grit aluminum oxide so surface is free of oil and surface contaminants.
- H. Wood Substrates:
1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 2. Sand surfaces that will be exposed to view, and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- J. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.



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2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Apply an additional coat of primer on metal surfaces that have been shop primed.
- B. Tinting: Tint primer of colors such as reds, yellows, and oranges with a gray basecoat system designed to help provide color coverage.
1. Do not tint prime or base coat for multi-colored finishes.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces. When using colors such as red, yellow or orange, an extra coat of finish may be necessary. Notify Architect when additional coats do not fix the problem.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
1. Mechanical, Plumbing and Fire Protection Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.



- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

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3.5 INTERIOR PAINTING SCHEDULE

- A. VOC Compliance, General: Provide the manufacturers' formulations for the products specified below that comply with the VOC requirements for the State of Maine Department of Environmental Protection in paragraph 2.2 of this Section.
- B. Concrete Substrates, Traffic Surfaces:
 - 1. Latex Floor Coating System:
 - a. Prime Coat: Latex floor and porch paint (low gloss).
 - b. Intermediate Coat: Latex floor and porch paint (low gloss).
 - c. Topcoat: Latex floor and porch paint (low gloss).
- C. Concrete Substrates, Precast Concrete Plank Ceilings:
 - 1. Spray Texture Coating System:
 - a. Preparation: Caulk plank joints.
 - b. Prime Coat: Low-VOC latex primer/sealer.
 - c. Sprayed Texture Coat: Sheetrock Brand Ceiling Texture (Tuf-Tex).
 - 1) Texture Type: Medium Stipple.
 - d. Topcoat: Low-VOC latex flat paint.
- D. CMU Substrates:
 - 1. Low-VOC Latex System:
 - a. Prime Coat: Latex block filler.
 - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
 - c. Topcoat: Low-VOC latex low-luster paint.
 - d. Previously Painted Existing CMU: Topcoat only
 - e.
 - 2. High-Performance Epoxy System:
 - a. Prime Coat: Latex block filler.
 - b. Intermediate Coat: High-performance architectural latex matching topcoat.
 - c. Topcoat: High-performance architectural latex (semigloss).



- E. Steel Substrates: Including, but not limited to steel doors and frames, steel stairs (including risers and stringers), handrails and guardrails, lintel plates and angles, wood door glass lite kits and astragals, access panels (both sides), metal fabrications; see Division 05 Section "Metal Fabrications", and miscellaneous metal items.
1. Low-VOC Latex Over DTM Primer System:
 - a. Prime Coat: DTM anticorrosive metal primer.
 - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
 - c. Topcoat: Low-VOC latex semi-gloss paint.
- F. Galvanized-Metal Substrates:
1. Low-VOC Latex Over DTM Primer System:
 - a. Prime Coat: DTM anticorrosive metal primer.
 - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
 - c. Topcoat: Low-VOC latex semi-gloss paint.
- G. Wood For Painted Finish: Including windows standing and running trim.
1. Low-VOC Latex System:
 - a. Prime Coat: Interior latex-based wood primer.
 - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
 - c. Topcoat: Low-VOC latex (semigloss) paint.
- H. Wood Doors: Including doors for paint finish.
1. Low-VOC Latex System:
 - a. Prime Coat: Factory provided prime coat.
 - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
 - c. Topcoat: Low-VOC latex (semigloss) paint.
- I. Gypsum Board Substrates:
1. Low-VOC Latex System:
 - a. Prime Coat: Low-VOC latex primer/sealer.
 - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
 - c. Topcoat: Low-VOC latex (flat for ceilings) (eggshell for walls) paint.
 - d. Previously Painted Existing Gypsum Board: Topcoat only
 2. High-Performance Epoxy System:
 - a. Prime Coat: Latex primer/sealer.
 - b. Intermediate Coat: High-performance epoxy matching topcoat.
 - c. Topcoat: High-performance epoxy (semigloss).
- J. Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.



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1. Latex System:
 - a. Prime Coat: Latex primer/sealer.
 - b. Intermediate Coat: Latex paint matching topcoat.
 - c. Topcoat: Latex flat paint.

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SECTION 10 28 00

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Toilet and bath accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.
- D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for 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.



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1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
1. Bobrick
 2. ASI
 3. Approved equivalent.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Toilet and Bath Accessory Schedule at the end of Part 3 or as shown on the Drawings.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.3 BATHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in this section or substitute product by approved substitution.
1. Approved Manufacturer: Bobrick



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2. Stainless steel finish
- B. Paper Towel Dispenser/Disposal:
 1. Mounting: Semi-recessed mounted
 2. One (1) per bathroom
 3. Semi-recessed mounted unit: B-38032
- C. Toilet Tissue Dispenser:
 1. One (1) per toilet
 2. Mounting: Surface mounted with concealed anchorage.
 - a. Recessed or partition mounted as possible
 3. Unit: B-2888
- D. Soap Dispenser:
 1. Mounting: Surface mounted
 2. One (1) per sink
 3. Unit: B-2112
- E. Metal Framed Mirror:
 1. Mounting: Surface mounted
 2. One (1) per sink
 3. Unit: B-165
 4. Size: 24" x 36"
- F. Grab Bars: Where this designation is indicated, provide stainless-steel grab bar complying with the following:
 1. Products: Available products include the following:
 - a. Bobrick No. B-5806 Series.
 2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch (1.3 mm).
 3. Mounting: Concealed with manufacturer's standard flanges and anchors.
 4. Gripping Surfaces: Manufacturer's standard slip-resistant texture.
 5. Outside Diameter: 1-1/2 inches (32 mm) for medium-duty applications.
 6. Provide per ADA requirements at the following locations:
 - a. HC Toilets
 - b. HC Apartment Showers
 - c. HC Apartment Showers
- G. Mop and Broom Holder: Where this designation is indicated, provide mop and broom holder complying with the following:
 1. Products: Available products include the following:
 - a. Bobrick No. B-223 x 36.
 2. Mop and Broom Holder: 36-inch- (914-mm-) long unit fabricated of minimum nominal 0.0375-inch- (0.95-mm-) thick, stainless-steel hat channel with four spring-loaded, rubber, cam-type, mop/broom holders.
 3. Provide one (1) per mop sink.
- H. Robe Hook: Where this designation is indicated, provide unit complying with the following:
 1. Products: Available products include the following:
 - a. Bobrick No. 7671
 2. Finish: Satin finish stainless steel unit.



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- I. Towel Bars: Where this designation is indicated, provide unit complying with the following:
 - 1. Products: Available products include the following:
 - a. Bobrick No. B-530
 - 2. Finish: Satin finish stainless steel.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. 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. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

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

END OF SECTION 10 28 00



SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.
- C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
- D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.



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1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International Ltd.
 - c. Badger Fire Protection; a Kidde company.
 - d. Buckeye Fire Equipment Company.
 - e. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - f. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - g. Larsen's Manufacturing Company.
 - h. Potter Roemer LLC.
 2. Valves: Manufacturer's standard.
 3. Handles and Levers: Manufacturer's standard.
 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.



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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International Ltd.
 - c. Badger Fire Protection; a Kidde company.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - g. Larsen's Manufacturing Company.
 - h. Potter Roemer LLC.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

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SECTION 22 00 00
PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings, Addenda, General Provisions of Contract, including General and Supplementary conditions and General Requirements apply to work specified in this Section.

1.2 DEFINITIONS

- A. ADA: Designed to meet the requirements of the Americans with Disabilities Act.
- B. Adaptable: Designed so in the future it can be easily adapted to meet most of the essential requirements of the Americans with Disabilities Act with minor additions and adjustments, such as change of height of counter or addition of a lift seat.
- C. Concealed: Shall mean in walls, in chases, above ceilings, within enclosed cabinets, otherwise enclosed.
- D. Equal: Shall mean essentially the same as that product specified, but a model of a different manufacturer
- E. Exposed: Shall mean in finished spaces, in closets, under counters, behind and/or under equipment and/or otherwise visible.
- F. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- G. Materials: Shall mean any product used in the construction, including but not limited to: fixtures, equipment, piping and supplies.
- H. Others: Shall mean provided by sections other than this section. If not purposely assumed by another section, shall be provided by the Contractor.
- I. Piping: Shall mean pipe, fittings, hangers and valves.
- J. Provide: Shall mean the furnishing and installing of materials.
- K. Reviewed equal: Shall mean that the Architect or a designated Consultant, not the contractor, shall make final determination whether materials are an equal to that which is specified.



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- L. Substitution: Shall mean of materials of significantly different physical, structural or electrical requirements, performance, dimensions, function, maintenance, quality or durability, than that specified.

1.3 ALTERNATES

There are no alternates that apply to this section of the project.

1.4 DESCRIPTION OF WORK

A. Work Included

1. Furnish all labor, materials, equipment, transportation, and perform all operations required to install complete plumbing systems in the building, in accordance with these specifications and applicable drawings.
2. Provide the following:
 - a. Sanitary, waste and vent systems.
 - b. Domestic hot and cold water system.
 - d. Pipe, valve and fittings
 - e. Water specialties
 - f. Drainage specialties
 - g. Plumbing fixtures and accessories
 - h. Insulation
 - i. Installation and/or connections to fixtures/equipment provided by others.
3. Specifications and accompanying drawings do not indicate every detail of pipe, valves, fittings, hangers, fixtures and equipment necessary for complete installation; but are provided to show general arrangement and extent of work to be performed.

1.5 PERMITS

- A. This Contractor shall be responsible for providing and filing all Plans, Specifications and other documents, pay all requisite fees and secure all permits, inspections and approvals necessary for the legal installation and operation of the systems and/or equipment furnished under this Section of the Specifications.
- B. The Contractor shall frame under glass/ clear plastic all permits, secured by him, adjacent to the respective system and/or equipment and required to be displayed by Code, law or ordinance. Those permits secured but not required to be displayed shall be laminated in plastic and included in the Owner's maintenance manual.

1.6 CODES AND ORDINANCES



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- A. All work performed under this Section of the Specifications shall be done in accordance with applicable Federal Laws, Maine State Laws, Uniform Plumbing Code, Subsurface Wastewater Disposal Rules, and local plumbing codes and ordinances. The following standards are also to be followed when applicable:

ADA	Americans With Disabilities Act
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
IBC	International Building Code
NFPA	National Fire Protection Association (a.k.a. NFC, National Fire code)
NEMA	National Electrical Manufacturer's Association
OSHA	Occupational Safety and Health Act
UL	Underwriter's Laboratories

- B. If an obsolete code section or standard is specified, the latest replacement issue of each Code or standard for the application, in effect at the time of bidding, shall be used. Code requirements are the minimum quality and/or performance acceptable. Where the Specifications and/or Drawings indicate more stringent requirements, these requirements shall govern.

1.7 QUALITY ASSURANCE

- A. Use sufficient qualified workmen and competent supervisors in execution of this portion of the work to ensure proper and adequate installation of the system throughout. Work performed shall conform to manufacturers' recommendations, good standard practice and industry standards.
- B. Technical training of workmen installing the systems specified, by the systems manufacturer, shall be mandatory prior to commencement of work. Documentation of such certification shall be made available to the Architect upon request within 5 business days
- C. Any work deemed unacceptable by the Engineer, Architect or Clerk of the Works shall be redone correctly, at no additional cost to the owner.

1.8 ELECTRONIC DRAWINGS AND FILE SHARING

Plans and specifications may be made available in electronic format on request. Plans may be provided in either Adobe (.pdf) or CAD (.dwg or .dxf) formats and will be compressed using WinZip (.zip format). Recipient is responsible to obtain the necessary software to open the files. Note: CAD drawings will be made available to successful bidders only after a contract is awarded.

CAD drawings are produced with AutoCAD 2006 and may be provided in either the 2000 or 2004 file formats. Upon request for CAD files a release form will be provided which must be signed and returned to the Engineer prior to transmission of electronic files. Physical mailing address, telephone numbers and e-mail address for this office are indicated on each drawing. A signed



release will not be required for Adobe based files.

All contract documents are copyrighted material. No portion of materials may be reproduced or duplicated except as indicated in the release form. Where release forms are not required (Adobe based files), materials may be printed for use by the intended recipient only and may not be reproduced or copied in any other manner unless written permission is obtained.

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1.9 MATERIALS AND SUBSTITUTIONS

All materials and equipment shall be new and of the latest design of respective manufacturers. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise.

- A. Any proposal for substitution of Plumbing equipment shall be made in writing PRIOR TO OPENING OF BIDS. Submit full details for consideration and obtain written approval of the Architect. The phrase "or approved equal" shall be intended to mean that the Architect, not the contractor, shall make final determination whether or not substitute materials are an equal to that which is specified. The contractor shall be responsible to certify within his submittals that any equipment to be considered as an "approved equal" meets or exceeds the requirements of this specification in all aspects and will physically fit within the space provided and still provide adequate space adjacent to the equipment for service. If requested by the Architect the contractor shall provide said certification in the form of scale drawings before review will be made. Architect will not be responsible to provide drawings for substituted materials unless the substitution is agreed upon prior to opening of bids. Architect's decision on acceptability of substitute materials shall be final.
- B. Approval by Architect for such substitution shall not relieve the Plumbing Contractor from responsibility for a satisfactory installation and shall not affect his guarantee covering all parts of work
- C. Any material or equipment submitted for approval which are arranged differently or is/are of different physical size from that shown or specified shall be accompanied by shop drawings indicating different arrangements of size and method of making the various connections to equipment. Final results will be compatible with system as designed.
- D. Materials and equipment determined as an "approved equal" and /or substitutions must meet the same construction standards, capacities, code compliances, etc. as the equipment (i.e. manufacturer, model, etc.) specified.
- E. Any additional cost resulting from the substitution of equipment shall be paid by this Contractor.

1.10 PLANS AND SPECIFICATIONS FOR SUPPLIERS

This Contractor shall provide his Suppliers, and any related subcontractors, with a copy of the specification pages, and letter sized photocopies of equipment details and schedules, that pertain to the item to be supplied.



1.11 SHOP DRAWINGS & SUBMITTALS

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- A. As soon as possible after award of Contract (but not longer than 21 calendar days), before any material or equipment is purchased, Plumbing Contractor shall submit to the Architect no less than ten (10) copies of shop drawings for approval. If shop drawings are not submitted within the allotted time frame all substitutions included the late shop drawings will be invalid and the equipment specified must be provided. Any costs resulting from delays in the project schedule due to failure to submit shop drawings related to this section in a timely manner shall be the responsibility of the Plumbing Contractor.
- B. Each item shall be properly identified, preferably by fixture/equipment tag number (such as WC-3), and shall describe in detail the material and equipment to be provided, including all dimensional data, performance data, pump curves, computer selection print-outs, etc. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.
- C. Corrections or comments made on the shop drawings do not relieve the contractor from compliance with requirements of the drawings and specifications. Shop drawing review is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades and performing his work in a safe and satisfactory manner.
- D. Should any materials or products be purchased and/or installed without prior review and comment the contractor shall be required to remove or replace those products and/or materials if directed by the Architect at his own expense. If the materials are not removed (or replaced) or if the project is delayed as a result the Architect reserves the right to order the withholding of payment until the situation is resolved in a manner satisfactory to the Architect.
- E. Plumbing shop drawings shall be separate from Mechanical shop drawings. All submittals shall have a clear area on the front no less than 4inches x 3inches to be reserved exclusively for the Engineers' shop drawing stamp or they will be refused for re-submittal.
- F. It is desirable for shop drawings to be submitted electronically, including all documentation outlined in paragraph "A" above. Hard copies of shop drawings must be original documents or good quality photocopies of original documents (photocopies of color samples are not acceptable). Faxed copies of submittal sheets will be refused.
- G. Review must be obtained on all items specified in Section 2 Products or shown on the drawing, and any significant items implied or otherwise required but not specified.
- H. Format
1. Related items shall be stapled or Bound together as a package. The number of copies of each package shall be as listed above. Examples of packages of related items include:



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- a. Hangers and Supports
- b. Identification
- c. Insulation
- d. Valves
- e. Piping
- f. Plumbing Fixtures with accessories
- g. Drainage Specialties
- h. Water Specialties
- i. Pumps

2. If due to circumstances beyond his control, the contractor is unable to include all the related items in the submitted package, he shall insert in its place a plain sheet of paper with a notation stating that the item will be submitted separately.

1.12 PRODUCT HANDLING

Use all means necessary to protect materials before, during and after installation, and to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1.13 AS-BUILT DRAWINGS

Keep in good condition at the job, apart from all other prints used in actual construction, one complete set of all blueprints furnished for this job. On this special set of blueprints, record *completely and accurately* all differences between the work as actually installed and the design as shown on the drawings. These record prints must be kept up to date by recording all changes within one week of the time that the changes are authorized. At the completion of the work, this set of drawings shall be delivered to the Architect for the Owner electronically in the form of CAD drawings. If a complete record of changes is not made and electronic CAD drawings not provided by the Plumbing Contractor, a record shall be made by the Engineers, and *the cost of the record shall be paid by the Plumbing Contractor*. Copies of the plumbing CAD drawings may be made available electronically to the Contractor if desired. Drawings shall be dated accordingly and clearly identified as "AS-BUILT". Contact the Architect directly or the Engineer via e-mail at mechsyst@maine.rr.com. Specify required CAD format when requesting the files. CAD drawings were generated using AutoCAD 2006 and utilize both paper space and model space with external references to various other drawings. Files will be compressed and will require "WinZip" (<http://www.winzip.com>) for extraction. A release form will be provided which must be signed and returned to the Engineer prior to transfer of files.

1.14 MAINTENANCE MANUAL

On completion of this portion of the work, and as a condition of its acceptance, submit for review two copies of a manual describing the system. Plumbing equipment manuals shall be separate from mechanical manuals. All manuals shall be original copies, not photocopies, or they will be refused for resubmittal. Prepare manuals in durable 3-ring binders approximately 8.1/2" by 11" in size with at least the following:



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- A. Project name on the spine and front cover, and identification on the front cover stating the project name, general nature of the manual, and name, address and telephone number of the General and Plumbing Contractors.
- B. Neatly typewritten index.
- C. Complete instructions regarding operation and maintenance of all equipment involved.
- D. Complete nomenclature of all frequently replaceable parts and supplies, their part numbers, and name, address and telephone number of the vendor.
- E. Copy of all guarantees and warranties issued, and dates of expiration.
- F. Shop drawings and equipment/fixtures manufacturer's catalog pages. Clearly indicate the precise item included in this installation and delete, cross out or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.

1.15 OBJECTIONABLE NOISE AND VIBRATION

All equipment shall operate without objectionable noise and vibration. Should objectionable noise or vibration be transmitted to any occupied part of the building by apparatus or piping, as determined by the Architect, the necessary changes eliminating the noise or vibration shall be made by this Contractor at no extra cost to the Owner.

1.16 GUARANTEE

This Contractor shall guarantee all materials and workmanship furnished by him or his sub-contractors to be free from all defects for a period of no less than one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner. Any additional costs required to extend manufacturer's guarantee and warranty for the period specified, shall be included in Contractor's base bid.

1.17 DEVIATIONS, DISCREPANCIES AND OMISSIONS

- A. The drawings are intended to indicate only diagrammatically the intent, extent, general character and approximate locations of plumbing work. Work indicated, but having details obviously omitted, shall be furnished complete to perform the functions intended without additional cost to the Owner. This shall include but not be limited to:
 - 1. All items that are required to meet all applicable codes and referenced standards.
 - 2. Piping for cold and hot water supply, drain, vent, gas, etc. to each plumbing fixture/equipment shown on the drawings, or scheduled as required.
 - 3. Shut-off valves on lines feeding individual fixtures without integral stops.



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4. Minor single phase electrical wiring, or control wiring, between Plumbing provided items that require it, unless indicated on the Electrical Drawings.
 5. Plumbing related items indicated on the drawings of other trades.
 6. Items indicated on one plumbing drawing but not shown on a corresponding drawing.
 7. Items implied on the plumbing drawings but not shown.
 8. All plumbing related items clearly shown in dark print on the Plumbing drawings but not included in the specification, unless it is noted as being provided by the owner or other contractor or unless other sections assume the responsibility.
- B. The drawings and specifications are complimentary to each other and what is called for in one shall be as binding as if called for by both. In the event of conflicting information on the drawings, or in the specifications, or between drawings and specifications, or between trades, that which is better, best, most expensive, or most stringent shall govern.

1.18 WORKPLACE SAFETY

- A. The Trade Contractor alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods, and for any damage, which may result from their failure of their improper construction, maintenance, or operation.

1.19 CHANGE ORDERS

- A. No change shall be made from the work, equipment, or materials under this section except as directed in writing by the Architect or Engineer of record.
- B. All requests for change in contract price and scope shall be accompanied by a breakdown list of materials with unit and extended prices and labor hours with unit and extended price, plus markups that have been applied.



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PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise indicated, the materials to be furnished under this contract shall be new and the standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest standard design that complies with the specification requirements.
- B. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise. An entire product line may be rejected if one, or more, of the products submitted is not an equal to that specified.
- C. Unspecified items shall be by the same manufacturer and level of quality and as similar items specified, whenever possible. Whenever items have no similarity to those specified in this section, provide the equivalent item as specified in other Division 22 Sections. When no similarity exists in other sections, the Contractor shall submit for review an appropriate commercial/institutional quality item, complete to perform the functions intended, using his best discretion. The Architect or a designated Consultant, not the contractor, shall make final determination whether materials are of suitable quality and perform the functions intended.

2.2 HANGERS AND SUPPORTS

A. General

- 1. All hangers and supports shall be especially manufactured for that purpose and shall be the pattern, design and capacity required for the location of use.
- 2. Piping specified herein shall not be supported from piping of other trades.
- 3. All steel hangers shall be factory painted.
- 4. Hangers shall be heavy-duty steel adjustable clevis type, plain for steel, cast iron and plastic pipe, and copper plated for piping in direct contact with copper tubing (if any).
- 5. Hangers shall go outside of insulation for domestic water piping. Each hanger shall be furnished with metal shield.
- 6. Exposed vertical risers $\frac{3}{4}$ inch and smaller shall be supported at 6 foot intervals between floor and ceiling with split ring type hangers; copper plated for piping in direct contact with copper tubing equal to Carpenter & Paterson Inc.,. ALL PIPING DROPS TO FIXTURES SHALL BE ANCHORED SOLID TO WALL WITH A STEEL SUPPORT BRACKET WITH ADJUSTABLE CLIP, ESPECIALLY PIPING TO FLUSH VALVES
- 7. Piping suspended from walls and partitions shall be supported by steel support



bracket with adjustable clips equal to Carpenter & Paterson Inc. All attachments to bar joists shall be from top chord.

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B. Hanger Rods & Attachments

1. Hanger rods shall be galvanized all thread rod. Rod size shall be as follows:

<u>Pipe Size</u>	<u>Rod Size</u>
3/8" to 2"	3/8"
2.1/2" to 3.1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

2. All nuts for hanger rods and hangers to be galvanized steel.
3. Provide lag points with rod couplings for fastening to wood, toggle bolts in concrete blocks and compound anchor shields and bolts in poured concrete.
4. Provide toggle bolts with rod couplings for fastening in the pre-cast concrete plank decks.
5. Provide and install angle iron supports for pipe hangers in locations as required. Angle iron supports shall be adequate size for span and piping or equipment.
6. Hot and cold water piping at each fixture shall be securely fastened in wall with split ring type hanger fastened to studs within wall.

2.3 SEISMIC RESTRAINT

All seismic restraints shall be in accordance with the International Building Code.

2.4 IDENTIFICATION

- A. Tag each new pump /equipment, and switch with 2½ inches x ¾ inch rectangular engraved nameplates with white letters on black, #2060-20 by Seton Name Plate Corp. or reviewed equals. Nameplates shall be mechanically fastened to equipment (adhesives are not acceptable). Embossed labels are not acceptable.
- B. Identify all new water and drain piping with "Set Mark" snap-around pipe markers by Seton Name Plate Corporation or reviewed equal. Markers shall include both identification and arrows indicating direction of flow. Markers shall be placed on pipe segments 5 feet and longer, and spaced no less than 10 feet apart. Heating hot water piping shall be labeled differently from Domestic hot water piping. On parallel runs of piping, plumbing markers shall be grouped together, and grouped with heating markers whenever practical.

<u>Legend</u>	<u>Background/Letter Color</u>
"Cold Water"	Green/ white letters
"Domestic 120°F Water"	Yellow/ black letters



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“Domestic 120°F Return”	Yellow/ black letters
“Domestic 140°F Water”	Yellow/ black letters
“Plumbing Vent”	Green/ white letters
“Sanitary Drain”	Green/ white letters

- C. Tag all new valves with Seton #M4506 1½ inch square brass tags and #6 bead chains, stamped with the following identification: “CW”, “HW”, “HWR” or “140HW”. Tag shall be consecutively numbered. DO NOT DUPLICATE EXISTING VALVE IDENTIFICATION NUMBERS. Fixture stops, control valves or valves adjacent to equipment, the use of which is obvious, are not to be tagged.
- D. Provide valve charts identifying valve number, valve identification and service (i.e. Apt. 203, HW). Mount charts in Boiler Room and Mechanical Room in 8½ inch x 10 inch and 8½ inch x 11 inch self-closing aluminum frame with plastic windows. Provide additional copies for maintenance manuals.

2.5 INSULATION

- A. All Domestic Water Piping, All Above Slab Storm Water
1. Exposed Piping: Insulate exposed piping above slab/grade with Owens Corning Evolution SSL II paper free ASJ with tough, wrinkle resistant, easy to-clean jacket, or approved equal. Install with great care for appearance, turning any writing or seams toward the wall. Or reviewed equal.
 - a. Option: use standard Owens Corning fiberglass insulation with ASJ or approved equal, and carefully and neatly cover it with a white PVC plastic covering material. Covering shall be applied in no less than 4 foot lengths with shingle joints. Longitudinal joints shall be on the top or back sides so as to be out of sight and sealed with adhesive materials provided with the jacketing. Material shall be butted to finish walls or Insulation. Jacketing material shall be Zeston pre-cut, pre-curved 0.030 thickness. Or reviewed equal.
 2. Concealed piping and piping in Mechanical rooms: Insulate with well installed and sealed Armaflex Pipe Insulation with pressure sealing lap adhesive, or equal.
 - a. Option: use standard Owens Corning fiberglass insulation with ASJ or approved equal.
 3. Thickness as follows:
 - a. Hot water mains, recirculated hot water branches and recirculation returns: 1 inch thick minimum.
 - b. Unrecirculated hot water branches: 1” thick.
 - c. Cold water piping: ½” thick minimum.
 - d. Pex run-outs to individual fixtures, any temperature (if any): ½ inch thick to allow bending.
 4. Insulate any below grade hot water piping run outs with ½” Armaflex closed cell piping insulation.



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5. Insulate roof drain sumps penetrating the roof with ½” Armaflex closed cell sheet insulation neatly applied.

B. Fittings

1. All fittings and valves shall be covered with a one piece PVC insulated fitting cover secured.
2. The ends of insulation on exposed pipes at valves, flanges, unions, etc., shall be finished neatly with covering to match jacket and secure with mastic.
3. Valves, flanges and unions on hot water piping shall not be insulated.

C. Installation

All insulation work shall be executed by skilled insulation workmen regularly in the trade.

2.6 VALVES

A. General

1. Valves shall be provided as shown and as required to make the installation and its apparatus complete in operation; locate to permit easy operation, replacement and repair.
2. All valves must be so constructed that they may be repacked under pressure while open.
3. Check valves shall be installed in all lines where flow may reverse from intended direction.
4. Valves shall have name and/or trademark of manufacturer as well as working pressure stamped or cast on valve body.
5. Valves shall comply with Manufacturer’s Standards Society (MSS) specifications and be so listed.

B. Types and Manufacturers

All valves shall be of one manufacturer and by one of the manufacturers listed. The following list is provided as a means of identifying the quality and type required.

1. Gate Valves 3 inches in size and smaller

Shall have bronze bodies, rising stem, solid wedge, union bonnet, rated for 150# WSP, 300# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1169	1151



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Stockham	B-124	B-120
NIBCO	S-134	T-134
Hammond	IB648	IB629

2. Globe Valves 2 inches in size and smaller

Shall have bronze bodies, union bonnet, renewable composition disc for service intended, rated for 150# WSP, 300# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1590-T	590-T
Stockham	B-24-T	B-22-T
NIBCO	S-235-Y	T-235-Y
Hammond	IB423	IB413T

3. Angle valves

Same general description and manufacturers as globe valves above, only outlet at 90 degree angle from inlet.

4. Ball valves 1¼ inches in size and smaller

Shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blowout proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be “full port”. Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	BA-350S	BA-300S
Apollo	82-200	82-100
Watts	B-6081	B-6080
NIBCO	-----	-----
Hammond	8614	8604

5. Ball valves 1½ inches in size and larger

Shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blowout proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be “conventional port”. Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Apollo	70-200	70-300
Watts	B-6000-SS	B-6001-SS
NIBCO	S-585-66	T-585-66
Hammond	8514	8503

6. Check Valves 2 inches in size and smaller

Shall be horizontal swing type with bronze body, Teflon disc. Rated for 125#



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WSP, 200# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1509-T	509-T
Stockham	B-310-T	B-320-T
NIBCO	S-413-Y	T-413-Y
Hammond	IB945	IB904

7. Spring loaded check valves 2” and smaller:

Bronze body, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, Teflon seat unless only bronze available.

	<u>Solder or Screwed Ends</u>
ConBraCo	61 series
Grinnell	3600SJ
Mueller	203BP
Nibco	S480Y
Val-Matic	S1400 series.

8. Drain Valves

Shall be conventional ball valves and provided with hose nipples and threaded metal cap on chain. Watts B-6001-CC or reviewed equal.

2.7 DOMESTIC WATER PIPING

A. Interior Exposed, High temperature and Supportive

1. All exposed piping carrying domestic water, all piping with a temperature above 140 deg. F., all piping supporting inline equipment (such as the water entrance or inline pumps), and piping within 6 ft of the water heaters, shall be hard-drawn type “L” copper tube with cast or wrought fittings and made up with Silvabrite 100 lead-free solder. Care shall be taken not to over flux.

B. Interior Concealed

All concealed hot (below 141) and cold water piping above finish floor (not buried) shall be one of the following:

1. Type L Copper and fittings, all sizes
2. PEX, sizes 2” and smaller
 - a. Uponor AquaPEX (PEX-a) (cross linked polyethylene tubing) piping and cold expansion fittings, specifically designed for domestic water. ASTM F 876, Fittings for PEX Tube: ASTM F 1960, insert type and matching PEX tube dimensions. Manifold (if used): Uponor multiple-outlet, corrosion-resistant assembly.



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- b. Piping shall be installed in a neat and orderly manner. No wild spaghetti installations will be tolerated. Piping shall be run straight and parallel, and level or sloped slightly to low points with no droops exceeding 1/8". Use PEX bend supports to keep turns tight and steel channel supports to keep piping supported. Any work that in the opinion of the Architect or Engineer of Record that does not meet these standards will be removed and redone at the Contractor's expense.
 - d. All PEX piping shall be insulated as indicated under Insulation. Use Armaflex insulation on piping run outs to individual fixtures to allow bending.
 - e. Provide the correct spacing of hangers (w/ saddles) for PEX; every 3' or as recommended by the Manufacturer. Do not use the spacing designated for CPVC or copper piping unless using steel u-shaped support channels under insulation. Provide a support bracket at rough-ins.
 - f. All work shall be done in accordance with the manufacturer's recommendations.
4. All buried water and trap primer piping shall be AquaPEX or type "K" soft copper tubing. No joints below slab.
 5. All buried hot water piping shall be insulated and sealed with 1/2" Armaflex. **Do not direct bury copper hot water piping.**
 6. All exposed, uninsulated water piping near fixtures in finished areas shall be chromium plated I.P.S. copper or red brass pipe or tubing and fittings. Valves shall also be chrome plated brass or bronze. Any chrome trim with wrench marks shall be removed and new trim installed.
 7. Type of tubing shall be stamped or printed on each length by Manufacturer.

2.8 SANITARY WASTE AND VENT PIPING

- A. All Vent and Sanitary Waste Piping (above and below slab), and Storm Water Piping below the slab.

Piping and fittings shall be PVC Schedule 40 polyvinyl chloride plastic, as per ASTM-A-2665 or latest standard. Solvent as per ASTM-D-2564.

2.9 PIPE SLEEVES AND ESCUTCHEONS

- A. Sleeves

1. Contractor shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than pipe. Piping passing through walls other than masonry shall be provided with # 24 gauge



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galvanized steel tubes with wired or hemmed edges.a

2. Sleeves set in concrete floors shall finish flush with underside, but extend minimum of 1 inch above finish floor. Weld clips to sleeves for support in concrete pre-cast planks of a size that will be covered by concrete topping. Sleeves set in partitions shall finish flush with each side.
3. Space between sleeves and pipes shall be sealed to make smoke and water tight with 3M Brand Fire Barrier Caulk CP25 or Putty 303.
4. Masonry sleeves shall be Schedule 40 steel pipe.
5. This Contractor has the option to use the Pro-set system on lieu of the above.

B. Exterior Sleeves

Where piping passes through exterior walls, provide and install a complete pipe sleeve/hydrostatic wall closure system.

1. Wall sleeve shall be schedule 40 steel pipe, two pipe sizes larger than carrier pipe. Sleeve shall be the same length as the thickness of the wall served.
2. The hydrostatic closure device shall consist of identical interlocking links of solid synthetic rubber compounded to resist ozone, water, chemicals and extreme temperature variations. Each link shall be connected by corrosion resistant bolts and nuts to form a belt that is to fit snugly around the pipe. Under each bolt and nut there shall be a metal pressure plate so that when each nut is tightened the rubber links will expand between the pipe and sleeve to form a continuous, air tight and water tight seal.
3. Units to be Link-Seal system Model LS wall seal by Thunderline Corp. or reviewed equal.

C. Escutcheons

Where piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel plated steel floor and ceiling plates.

2.10 PLUMBING FIXTURES

A. LV-1 Lavatory, Wall Mounted - ADA

1. AMERICAN STANDARD 955.01EC Murro Universal Design wall hung lavatory, for concealed arm support, center hole, vitreous china, rear overflow, rear drain, self-draining deck, color "white", 1-1/4" trap. 0059.020 Shroud/Knee Contact Guard, vitreous china. Or reviewed equal. Mount with rim at 34".
2. Moen model 8419F05, commercial brass lavatory faucet, single hole mount, 2-



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1/2" lever handle, pop-up metal drain assembly, chrome, meets ADA, 0.5 gpm aerator. Or reviewed equal.

3. Chrome plated angle supplies, wheel handle stops. Or reviewed equal.
4. Provide carrier.

B. MB-1 Mop Basin

1. The mop basin shall be Fiat MSB-2424, molded stone or reviewed equal. The molding shall be done in matched metal dies under heat and pressure resulting in a one-piece homogeneous product. Note: neither plastic nor fiberglass is considered an equal. Size of unit shall be 24"x24"x10" high.

The drain body shall be cast brass, chrome plated, complete with cast brass lock nut and gaskets. A combination dome strainer and lint basket made from #302, 16 gauge stainless steel attached with tamper proof screws shall be included. The drain body shall provide for a lead caulked joint to be 3" I.P.S.

Provide the following accessories:

- a. Stainless steel wall guard, MSG-2424
- b. Service faucet with vacuum breaker; integral stops and wall brace plate #830-AA, or reviewed equal.
- c. 30" Hose with 3/4" coupling at one end; Plate #832-AA.
- d. Mop Hanger, stainless steel, 24" long with (3) holders, Plate #889-CC.
- e. Silicone sealant #833-AA.
- f. Vinyl bumper guard #-77-AA.

C. SH-1` Shower, Transfer, right hand – ADA

1. Clarion MP3837RBF34 Independence Line shower 38" x 38" x 78" exterior dimensions, 3/4" threshold height (1/2" after 1/4" flooring), fiberglass gelcoat, rear drain. Provide 503218 L shaped grab bar, 5018 vertical grab bar, 660 Soap dish, brass drain, CR-35 curtain rod and curtain, 26" Phenolic fold-up seat (no padded seats allowed). Field install 1" high self-adhesive white vinyl collapsible dam kit 2.5a available from manufacturer. Or reviewed equal. Note: dimensional tolerances are small, so when providing an equal, any dimensional deviation will be the responsibility of the contractor to coordinate, correct and or mitigate, notify the Architect directly of the differences and obtain his approval before ordering. Also coordinate drain location with field installers if in a different location.
2. Controls shall be Moen model 8346EP15 metal commercial shower system with hand held shower head on adjustable bar, Posi-temp pressure balanced valve with trim, single handle, integral stops, chrome single function shower head, chrome. Or reviewed equal. Note: If providing an equal shower head flow to be 1.7 GPM or less. Or reviewed equal.

D. SK-1 Sink, Single Bowl – ADA



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1. Elkay LRAD-2522-65-4 single bowl stainless steel sink, 6-1/2" deep bowl, 18 gauge, type 302 SS, self-rim, satin finish, sound guard undercoating, 4 hole drilling, rear drain. Or reviewed equal. LK35 Strainer.
 2. Moen 8707 single lever kitchen faucet, deck plate, 9" spout reach, chrome, meets ADA. Provide 1.0 GPM aerator. Or reviewed equal.
 3. McGuire 1-1/2" P-trap, chrome plated angle supplies, wheel stops, wrought (not bell) escutcheons. Or reviewed equal. Provide Truebro handicapped insulation kit unless the legs will be protected by angled architectural panel where open below sink.
- E. WB-1 Ice Maker Water Box
1. Appliance supplied by Owner.
 2. Sioux Chief 696R fire rated drainage box, recessed, ABS, 2" drain, trim plate.
 3. Provide 1/4" Braided S.S. Flex connector of appropriate length from box to appliance.
- F. WC-1 Water Closet, Floor, right hand lever– ADA
1. AMERICAN STANDARD Cadet Pro Right height 16-1/2", Elongated Toilet, right hand trap lever, vitreous china, 1.28 GPF, Everclean surface, 3" non-adjustable piston flush valve, siphon jet action, left handed side mounted trip lever, close coupled tank, bolt caps, fully glazed trapway, color "white", 5 year warranty, 3517A.101 bowl with 4188A.155 tank with Aquaguard liner and trip lever located on the right hand side. Or Reviewed equal, if any.
 2. Church 293SS elongated molded open front seat with cover, commercial heavy duty, stainless steel hinges and bolts. Or reviewed equal by Bemis, American Standard, or Beneke.
 3. McGuire chrome water closet supply with wheel handle stop. Or reviewed equal.
 4. Install water closet solidly to floor; any wobbly water closets will be redone and all costs, direct and incidental, paid for by this contractor.
- G. WC-2 Water Closet, Floor, left hand lever– ADA
- Same as WC-1 except trip lever located on the left hand side.
- 2.11 EWC-1 Electric Wall Hung Water Cooler
- A. Product Specification
- Unit shall include electric water cooler with bottle filling station. EZS8WS shall deliver 8 GPH of 50°F drinking water at 90°F ambient and 80°F inlet water. EZSDWS shall



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deliver non-chilled drinking water. Units shall have pushbar activation. Bottle filling unit shall include an electronic sensor for touchless activation with auto 20-second shut-off timer. Shall include Green Ticker™ displaying count of plastic bottles saved from waste. Bottle filler shall provide 1.1-1.5 gpm flow rate with laminar flow to minimize splashing. Shall include integrated silver ion anti-microbial protection in key areas. Unit shall meet ADA guidelines. Unit shall be lead-free design which is certified to NSF/ANSI 61 and 372 and meets Federal and State low-lead requirements. Unit shall be certified to UL399 and CAN/CSA 22.2 No. 120.

B Standard Features

Sanitary, touchless activation with auto 20-second shut-off (Bottle Filler) • Easy-touch front and side pushbar controls (Cooler) • Integrated Silver Ion Anti-microbial Protection in key areas • Quick Fill Rate: 1.1 gpm (Ezs8ws); 1.5 gpm (Ezsdws) • Laminar Flow provides minimal splash • Real Drain System eliminates standing water • Visual User Interface display includes: • Innovative Green Ticker™ counts bottles saved from waste • Available with Flexi-Guard® StreamSaver™ or Vandal-Resistantt bubbler (t includes “VR” code in model no.) • Cooler panel finishes: Light Gray Granite Vinyl Clad Steel or Stainless Steel.

C. Cooling System

Compressor: hermetically-sealed, reciprocating type, single phase. Sealed-in lifetime lubrication. • Condenser: Fan cooled, copper tube with aluminum fins. Fan motor is permanently lubricated. • Cooling Unit: Combination tube-tank type. Self-cleansing. Continuous copper tubing with stainless steel tank. Fully insulated with EPS foam which meets UL requirements for self-extinguishing material. • Refrigerant Control: Refrigerant R134a is controlled by accurately calibrated capillary tube. • Temperature Control: Easily accessible enclosed adjustable thermostat is factory preset. Requires no adjustment other **Based on 80°F inlet water & 90°F ambient air temp for 50°F chilled drinking water. This specification describes an Elkay product with design, quality and functional benefits to the user.

D. Construction

Stainless Steel basin with integral drain • Galvanized structural steel cooler chassis provides structural integrity • Stainless steel bottle filler wrapper with ABS plastic Alcove • Cooler cabinet available as Light Gray Granite Vinyl Clad Steel construction • Flexi-Guard® StreamSaver™ Safety Bubbler (option) utilizes an infused

2.12 HWH-1 Hot Water Heater

- A. Tankless Water Heater shall be condensing, continuous, gas fired, direct vent, water heater(s) design certified to the ANSI Z21.10.3 standard for gas fired water heaters. Tankless Water heater(s) shall have internal microprocessor to regulate BTU output. Tankless Water Heater shall produce no more than 20 ppm NOx emissions when tested in accordance with the Rules and Regulations of the South Coast Air Quality Management District (SCAQMD).



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- B. Tankless Water Heater(s) shall be configured to operate with propane gas and a 120 volt/60 Hz AC power source.
- C. Tankless Water Heater(s) shall have a BTU input range of 15,200 BTU/hr. to 199,000 BTU/hr., thermal efficiency of 96%, Commercial, Energy Star rating, and a maximum hot water outlet capacity of 9.8 gallons per minute (with a 30 °F temperature rise).
- D. Tankless Water Heater(s) shall be microprocessor controlled and utilize a direct electronic ignition system (with no standing pilot), fully modulating gas control valve, turbine flow meter, automatic electro-mechanical water flow control valve, and water temperature thermistors to maintain outlet water temperature to the storage tank between ± 2 °F of set point temperature.
- E. Tankless Water Heater(s) shall incorporate the following internal safety devices: flame failure lockout, boiling protection lockout, thermal overheat protection, internal freeze protection for ambient temperatures as low as -22 °F, leak detection sensor, and lockout protection in the event of a blocked flue.
- F. Tankless Water Heater(s) shall be provided with a temperature thermostat with an adjustable set point range of 98 °F to 185 °F.
- G. Tankless Water Heater(s) shall also be capable of storing and displaying a history of up to 9 diagnostic maintenance codes, via the display on the temperature thermostat controller.
- H. Tankless Water Heater(s) shall have downward fired ceramic burners, solid brass water flow control valve, and solid brass inlet and outlet water connections.
- I. Provide with concentric combustion air / vent piping by Manufacturer

2.13 PLUMBING SPECIALTIES, DRAINAGE

- A. Carriers
 - 1. Wall hung fixtures including water closets, lavatories, lav-decks and drinking fountains shall be supported with adjustable floor mounted carriers to fit building conditions, piping system, and fixtures specified. Each carrier shall be provided with a wall finishing frame. All carriers shall be secured to the floor with tie down lugs.
 - 2. Carriers shall be as manufactured by Zurn or reviewed equal.
- B. Traps
 - 1. Traps of material and design as approved by the State and shall be furnished and installed at all fixtures and appliances. Trap each fixture separately, keeping all trap screws below water line; vent each trap. Make offsets in vent piping with 45-degree angle fittings when possible. Pitch horizontal vents toward waste lines, group vents and take through roof as shown. All traps, at fixtures and appliances



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shall be provided with accessible clean outs.

C. Cleanouts

Provide cleanouts for soil and waste where shown on the drawings and as required by code **12/03/2018**

1. Floor Cleanouts (FCO)

All floor cleanouts in concrete or tile shall be flush with finish floor.

a. Type "1", Round, for finished areas

Zurn ZN-1400-BP-K, polished nickel bronze top, bronze plug, anchor flange.

b. Type "2", Round, with carpet marker

Zurn ZN-1400-BP-CM polished nickel bronze top, bronze plug, anchor flange, and carpet marker.

2. Wall Cleanouts

All wall cleanouts shall be Zurn Z-1445 cleanout tee with threaded plug. Polished nickel bronze cover, Zurn ZANB-1462 or reviewed equal.

3. Flashing

Flash each above grade floor clean out with Chloraloy® 240 thermoplastic elastomeric sheet membrane for concealed waterproofing, or other approved flashing material, extending 24" beyond perimeter of clean out and lock into clamping collar.

D. Floor Drains (FD)

1. All floor drains above grade shall be complete and each provided with flashing flange, flange device, and 24"x24", Chloraloy® 240 thermoplastic elastomeric sheet membrane for concealed waterproofing, or other approved flashing material, lock into drain clamping collar.

2. Traps for floor drains shall be deep seal traps.

a. Type "1" Round w/ recessed grate

Cast iron body, flashing collar, polished bronze, 7" adjustable raised flanged (recessed grate), inside caulk, trap primer connection. Zurn ZB-415-7I-P or equal by Josam, Wade or Smith. Install with top of flange flush with floor so grate is recessed.

b. Type "2" Round w/ recessed grate



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Cast iron body, flashing collar, polished bronze, 7" adjustable raised flanged (recessed grate), inside caulk, trap primer connection. Zurn ZB-415-7I-P or equal by Josam, Wade or Smith. Install with top of flange flush with floor so grate is recessed.

2.14 PLUMBING SPECIALTIES, WATER

A. Hose Bibs (HB)

1. Type "1" Exterior Hose Bib

Zurn Z-1321 exposed Ecolotrol "Anti-Siphon" automatic draining, non-freeze wall hydrant, integral backflow preventer, all bronze interior parts, operating key. Or reviewed equal.

B. Shock Absorbers (SA)

Shock protection shall be provided where shown on drawings and at all quick closing devices. Devices shall be stainless steel shell, welded expansion bellows surrounded by on-toxic mineral oil or gas, pressurized compression chamber charged and factory sealed, all, in-line design, threaded nipple and PDI reviewed. Sized to meet the conditions.

1. Type "1", 'A' P.D.I. units

Zurn Z-1700, #100. Or reviewed equal.

C. Thermometer (T)

Units to be dial type, 4.1/2" with 30° to 180° range; Terice Universal angle or reviewed equal.

D. Pressure Gauge (P.G.)

Furnish and install pressure gauges with gauge cocks on piping where shown on drawings. The dial range shall be such that the normal pressure shall be approximately mid-way of dial. Gauges shall be Terice No. 600 or equivalent by Weiss or Nurnburg, 4.1/2" dial size, cast aluminum case, with brass "T" handle cocks and No. 872 bronze pressure snubbers on water units.

E. Vacuum Relief Valve

Watts Model N36 or reviewed equal.

F. Backflow Preventers (BFP)

Provide and install all necessary components to provide protection against potentially hazardous backflow or back siphonage and the contamination of the potable water system at the required GPM demand. Unit shall be UL, USC, ASSE, IAPMD and AWWA



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approved.

1. Type "1", Entrance

Watts 909QT-S Reduced pressure Zone backflow preventer, quarter turn full port ball valves, strainer. Or reviewed equal.

G. Mixing Valves (MV)

1. Type "1" Master Mixer

Leonard model 270-LF, 1/2" connections, 5.5 GPM @ 10 psi differential pressure for exposed piping, rough bronze, check stops, 0.25 GPM min flow, set at 120°F. Or reviewed equal

H Expansion Tank

Watts Model PET-5-M1. Potable water expansion tank, 1.25 gallon acceptance, 3/4" connection, precharged to 40 psi, recharge to average static pressure of system Or reviewed equal.

I. Relief Valve

Watts #530 calibrated pressure relief valve. Set at 100 PSI. Or reviewed equal.

2.15 VALVE BOXES, ACCESS DOORS AND PANELS

- A. Coordinate locations and furnish General Contractor with valve boxes, access doors/ panels for all locations where service access is required behind walls, above sheetrock and masonry ceilings, and below floors for equipment, piping, valves, and specialties furnished under Division 15.
- B. Shall be located in closets, storage rooms and/or other non-public areas whenever possible, in a workmanlike manner, positioned so that junction can be easily reached and the size shall be sufficient for this purpose . When required in corridors, lobbies or other habitable areas, they shall be located as directed by the Architect.
- C. Units shall have 16-gauge steel frame and 14-gauge steel hinged door panel. Door shall have concealed spring hinges allowing door to be opened to 175°.
- D. Units shall be factory primed for field painting by Section 09900.
- E. Provide UL-rated 1-1/2 hour Class B access panels where required to comply with applicable Code requirements.

2.16 FUEL GAS PIPING

- A. Coordinate with General Contractor and contact the Gas Supplier and for installation of gas meter/entrance. Provide a second regulator after the entrance if the one supplied by



the Gas Company is not adjustable within the range required of the gas using equipment.

- B. Piping after the entrance shall be Schedule 40 black steel pipe, ASTM 120 with 150# fittings.
- a. Piping 2" and less in diameter shall be screwed pattern malleable iron fittings, shall meet ASTM A-47, ASA B16.3. Pipe joint compound shall be used on all threaded joints.
- b. Piping shall use welded fittings if over 2" in diameter, or if pressure in excess of 14" W.C.
- C. Provide dirt leg, gas cock and union at each boiler. Provide gas cock and flex connect with union at any gas clothes dryer.
- D. Installation shall meet the requirements of the gas supplier and NFPA 54.

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PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that plumbing may be installed in strict accordance with all pertinent codes and regulations and the reviewed Shop Drawings.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.2 COORDINATION WITH OTHER TRADES

A. Before installation, participate in a coordination meeting with the Clerk of the Works, Construction Manager, Mechanical/HVAC, Fire Protection and Electrical trades. Establish and resolve areas of conflict and congestion, especially those indicated on the drawings. Priority to be given to HVAC equipment and large ductwork, then gravity piping, then small ductwork, then piping based on descending order of size. Special consideration given to allow access to valves, dampers etc.

B. Failure to coordinate will result in this contractor removing and relocating his piping at no additional expense to the owner.

3.3 INSTALLATION OF PIPING AND EQUIPMENT

A. General

1. Install all piping promptly, making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
2. Provide uniform pitch of at least $\frac{1}{4}$ inch per foot for all horizontal waste and soil piping 3" or less. For piping 4" and above, slope at $\frac{1}{8}$ " minimum per foot
3. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective material from the jobs site.
4. Install pipes to clear all beams and obstructions. Do not cut into or reduce the size of load carrying members without the approval of the Architect.



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5. Allow room between all piping and other obstructions to allow for the installation of the specified pipe insulation.
6. Plumbing vents
 - a. Back vent all plumbing fixtures.
 - b. Pitch all vents at 1/64" per foot minimum toward waste lines for proper drainage to prevent unintended traps.
 - c. Install vent piping with each bend 45 degrees minimum from the horizontal, wherever structural conditions will permit.
 - d. Group plumbing vents and take through roof as shown.
 - e. Increase vents 3" and smaller one size before going thru roof. Make size transition a minimum of 12" below the surface of flat roofs and 72" (or as structure permits) below sloped roofs.
 - f. Terminate 18" to 24" above roof.
 - g. If installing in locations other than as shown on the drawings, line up with other plumbing vents for a neat appearance.
 - h. Do not install plumbing vents within 10 feet of an operable window or door or within 25 feet of a ventilation air intake.

6. All risers and off-sets shall be substantially supported.

7. Pipe hangers shall be placed on center as follows:

<u>MATERIAL</u>	<u>HORIZONTAL</u>	<u>VERTICAL</u>
Copper 1-1/4" & less	6'	6'
1-1/2"	6'	10'
2" & up	10'	10'
PVC, DWV	4'	4'
Steel	10'	10'

8. Arrange all piping to maintain required grade and pitch to lines to prevent vibration. Expansion loops to anchors shall be provided where shown on drawings.
9. Make all changes in pipe size with reducing fittings.
10. All low points in water piping shall be drained with 1/2" gate valve with hose nipple and metal cap.
11. No piping shall be installed in such a manner to permit back-siphonage or flow of any liquid in water piping under any conditions.
12. No water piping shall be installed outside of building or in an exterior wall unless adequate provisions are made to protect such pipe from freezing.
13. All piping and drain openings left unattended will be capped, plugged or securely covered to prevent accidental entry of foreign matter. Roof drains in use will be provided with domes.

B. Joints and Connections



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1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality Teflon tape to all male pipe threads but not to inside the fittings; use graphite on all clean out plugs. DO NOT use Teflon tape on gas piping.
 2. Smoothly ream all cut P.V.C. pipe. Clean and use solvent for fitting connection and in strict accordance with the manufacturer's recommendations.
 3. Make all joints in copper water tube with solder applied in strict accordance with the manufacturer's recommendations.
- C. Coordinate with the concrete contractor to depress the finished floor where indicated on drawings. Install floor drains at low points of surface areas to be drained. Adjust grates of drains 1/32" below finished floor, unless otherwise indicated. Finished floor shall be depressed according to the following drainage area radii:
1. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 2. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 3. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3.4 STERILIZATION AND FLUSHING OF PIPES

- A. After preliminary purging of the system, chlorinate the new potable water system in accordance with the current recommendations of the American Water Works Association, and in accordance with all pertinent codes and regulations. Chlorinate only when the building is unoccupied.
- B. Upon completion of the sterilization, thoroughly flush the entire potable water system.
- C. After sterilization and flushing are complete, a sample shall be collected from the end of the longest main, or at any other location selected by the Architect, and a water analysis test provided. The test must prove the water acceptable or additional disinfecting of system performed. A copy of the test report shall be submitted to the Architect.

3.5 CLOSING IN UNINSPECTED WORK

- A. Do not cover up or enclose work until it has been properly and completely inspected and approved.
- B. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect and at no additional cost to the Owner.



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3.6 TESTING OF PIPING

Tests shall be applied to the plumbing installation as required by codes and where as directed by the Architect, and in all cases before work is covered by earth fill or pipe covering.

- A. Sanitary piping shall be tested when all underground work is complete (before covering) and again, after all piping is installed, but before it is further closed in. Sanitary systems shall be securely stopped, except at the highest point, and the entire system filled with water to the point of overflow for 24 hours. All leaks shall be repaired. Cracked pipes and fitting shall be removed and replaced. No doping of soil pipe or fittings will be allowed. Plan testing around expected weather and temperature conditions or provide protection so that pipes do not freeze.
- B. New domestic water piping shall be filled and subjected to a hydrostatic pressure test of 150 psi for 8 hours with no leaks. If leaks are detected they shall be repaired and the test repeated until work is tight. NOTE: Testing with compressed air only is NOT ACCEPTABLE.
- C. Testing of Fuel Gas piping shall conform to NFPA 54.

3.7 CLEANING

Prior to acceptance of the buildings, thoroughly clean all exposed portions of the this installation, removing all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item, being careful to avoid all damage to finished surfaces. Additional attention may be required to thoroughly clean any used, re-used or owner provided fixtures. Clean out all strainers and aerators and adjust or replace washers, cartridges, etc.

3.8 INSTRUCTIONS

On completion of the job, this Contractor shall provide a competent technician to thoroughly instruct the Owner's Representative in the care and operation of the system. The time of instruction shall be arranged with the Owner.

3.9 RECYCLING

Discarded materials, both new and removed, shall be recycled whenever practical through metal salvage dealers (piping, etc.), paper salvage (cardboard shipping containers, etc.), wood products, etc. The Plumbing Contractor shall retain the salvage value of discarded materials and may use this value to offset his project bid price if so desired. Toxic materials such as adhesives, coolants, etc. SHALL be disposed of in a manner acceptable to the State of Maine Department of Environmental Protection.

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3.10 HAZARDOUS MATERIALS

Mercury or any other material deemed by the Federal Environmental Protection Agency or the State Department of Environmental Protection to be hazardous shall not be used in any components of the plumbing systems.

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SECTION 23 00 00
MECHANICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

General Provisions of Contract, including General and Supplementary conditions and General Requirements (if any) apply to work specified in this Section.

1.2 ALTERNATES

There are no alternates that pertain to this section of the work..

1.3 DEFINITIONS

ATC	Automatic Temperature Control
EC	Electrical Contractor (Division 26)
GC	General Contractor
HC	Heating (mechanical) Contractor
PC	Plumbing Contractor (Div. 22)
TAB	Testing and Balancing

1.4 DESCRIPTION OF WORK

A. Work Included

1. Furnish all labor, materials, equipment, transportation and perform all operations required to install a complete heating, ventilating, heat recovery and air conditioning system in the building, in accordance with these specifications and applicable drawings.
2. All temperatures are expressed in degrees Fahrenheit.
3. Work to be performed shall include, but is not limited to, the following:
 - a. Provide and install forced hot air heating systems in building areas indicated on drawings.
 - b. Provide and install forced air heat recovery ventilation system in building areas indicated on drawings.
 - c. Provide and install direct expansion air conditioning systems in building areas indicated on drawings.
 - d. Pipe, valve and fittings
 - e. Insulation
 - f. Sheetmetal
 - g. Automatic Temperature Control (ATC)
 - h. Tests and balance
5. Specifications and accompanying drawings do not indicate every detail of pipe, valves, fittings, hangers, ductwork and equipment necessary for complete



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installation; but are provided to show general arrangement and extent of work to be performed.

6. Before submitting proposal, Mechanical Contractor shall be familiar with all conditions. Failure to do so does not relieve Mechanical Contractor of responsibility regarding satisfactory installation of the system.
7. Mechanical contractor shall be responsible for rigging to hoist his own (and his sub-contractors') materials and equipment into place.
8. Mechanical contractor and his sub-contractors shall be responsible for start-up of all equipment provided under this section.

B. Related Work Described Elsewhere

1. Excavation and backfill
2. Cutting and patching
3. Firestopping between building construction and pipe sleeves.
4. Electrical conduit and wiring, except as noted below
5. Roofing, setting of curbs and framing of openings.
6. Setting of sleeves in masonry work (sleeves provided by Mechanical Contractor)
7. Door louvers
8. All finish work

C. Mechanical Electrical Work

1. Provide and erect all motors, temperature controls, limit switches as specified.
2. Power supply to switches, fused switches, outlets, motor starters, to line terminals of equipment, and all related wiring and fuses to properly connect and operate all electrical equipment specified shall be furnished and installed under Division 26, "ELECTRICAL". Division 26 shall not mount electrical equipment to indoor mechanical equipment without the consent of Division 23. Division 26 shall not drill wiring holes in equipment casings but shall make use of factory wiring knockouts when present. Coordinate all wiring between Mechanical and Electrical to provide a complete and operating system.
3. All wiring provided under this section shall comply with the requirements of Div. 26 and be in accordance with the latest rules and regulations of the National Fire Underwriters, National Electric code, National Fuel Gas Code, State of Maine Oil Burner Code, and Local Codes. Install all wiring under the supervision of Division 26. Any wiring that is not installed according to these standards, and which does not match wiring installed by Division 26 in type, quality and appearance shall be corrected by Division 26 at the expense of this section.



5. Automatic Temperature Control (ATC) Systems

Power wiring (as prescribed in this section) and all control wiring shall be furnished and installed by ATC Contractor under supervision of Division 26. Any wiring that is not installed according to these standards, and which does not match wiring installed by Division 26 in type, quality and appearance shall be corrected by Division 26 at the expense of this section.

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Division 26 shall provide not less than two (2) 15 amp dedicated circuits for control power (not including power for an ATC panel, if provided). Wire each circuit to junction boxes in close proximity to the panel(s) clearly identified as "Control Power Only". ATC Contractor shall obtain control power from these circuits only.

Low voltage control wiring must be plenum rated and adequately supported with no sags or "droops". Low voltage wiring need not be installed in conduit unless required by local code.

6. Air Handlers and Furnaces

Division 26 shall provide power for each air handler/furnace and wire to unit disconnect switches.

7. Compressor/Condenser Units

Division 26 shall provide exterior disconnect and wire to unit.

8. Convenience Receptacles

Division 26 is requested to provide and install duplex convenience receptacles within 12 feet of each air handling unit and compressor/condenser unit.

1.5 PERMITS

- A. This Contractor shall be responsible for providing and filing all Plans, Specifications and other documents, pay all requisite fees and secure all permits, inspections and approvals necessary for the legal installation and operation of the systems and/or equipment furnished under this Section of the Specifications.
- B. The Contractor shall frame under glass/clear plastic all permits, secured by him, adjacent to the respective system and/or equipment and required to be displayed by Code, law or ordinance. Those permits secured but not required to be displayed shall be laminated in plastic and included in the Owner's maintenance manual.



1.06 CODES, ORDINANCES AND PERMITS

- A. All work performed under this Section of the Specifications shall be done in accordance with applicable National, State and local Codes, Laws and Ordinances. The following abbreviations are used for reference to standards which are to be followed:

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AABC	Associated Air Balance Council
ADA	Americans With Disabilities Act
AMCA	Air Movement & Control Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BOCA	Building Officials and Code Administrators
NEC	National Electrical Code
NFPA	National Fire Protection Association
NEMA	National Electrical Manufacturer's Association
OSHA	Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriter's Laboratories

- B. The latest issue of each Code in effect at the time of bidding shall be used. Code requirements are the minimum quality and/or performance acceptable. Where the Specifications and/or Drawings indicate more stringent requirements, these requirements shall govern.

1.7 QUALITY ASSURANCE

- A. Mechanical Contractor shall have prior experience with at least two projects of this nature, size and scope and be capable of producing references indicating as such.
- B. Use sufficient qualified workpersons and competent supervisors in execution of this portion of the work to ensure proper and adequate installation of systems throughout. Technical training and certification of workpersons installing the systems specified, by the systems manufacturer, shall be mandatory prior to commencement of work. Documentation of such certification shall be made available to the Architect upon request within 5 business days.
- C. Work performed shall conform with all Local and State Rules and Regulations, as well as those of the International Building Code and National Fire Protection Association (N.F.P.A.).
- D. Piping design shall conform to ANSI, ASME B31.9 and AWS D10.9 codes.



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1.8 PLANS AND SPECIFICATIONS

Mechanical Contractor shall provide his sub-contractors with a copy of the entire portion of Part 1 of this specification, portions of this specification and copies of drawings which pertain to the equipment to be supplied at no cost to the sub-contractor. Provide ATC Contractor with entire set of Electrical plans and specifications. Provide Testing and Balancing sub-contractor with copies of shop drawings indicating coil GPM's, air handling unit air volumes, etc. Failure to do so may result in the Architect providing the required materials at the Contractor's expense.

Sketches pertaining to changes and amendments during construction (ASI's, RFI's and RFP's for example) shall be contract form documents issued by the Architect and/or Engineer for use during construction and it shall be the Architect's and/or Engineer's discretion to provide sketches or full size drawings. Requests for documentation other than what is provided (full size revised drawings for instance) and deemed suitable for the particular situation shall be paid for by the contractor making the request. The cost(s) shall include, but not limited to, drafting time and reproduction costs.

1.9 ELECTRONIC DRAWINGS AND FILE SHARING

Plans and specifications may be made available in electronic format on request. Plans may be provided in either Adobe (.pdf) or CAD (.dwg or .dxf) formats and will be compressed using WinZip (.zip format). Recipient is responsible to obtain the necessary software to open the files. Note: CAD (.dwg and .dxf) files will be made available to successful bidders only after a contract is awarded.

CAD drawings are produced with AutoCAD and will be provided in the 2010 file format. Upon request for CAD files a release form will be provided which must be signed and returned to the Engineer prior to transmission of electronic files. Physical mailing address, telephone numbers and e-mail address for this office are indicated on each drawing. A signed release will not be required for Adobe based files. E-mail requests may be made at kurt@mechanicalsystemseng.com

1.10 MATERIALS AND SUBSTITUTIONS

All materials and equipment shall be new and of the latest design of respective manufacturers. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise.

- A. Any proposal for substitution of Mechanical equipment, materials or vendors not mentioned in this specification shall be made in writing via letter or e-mail to the Architect or Engineer up to four working days prior to opening of bids to permit sufficient time to notify all bidders via addenda. Any requests made after the final addenda prior to bid opening will not be considered. Contractor must certify within his submittals that any equipment or materials requested to be considered as an "approved equal" meets or exceeds the requirements of this specification in all aspects and will physically fit within the space provided while providing adequate clearances for servicing of equipment as required by the manufacturers and will not interfere with other trades. Architect will not be responsible to provide drawings for substituted materials unless the substitution is agreed upon prior to opening of bids.



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- B. The phrase "or approved equal" shall be defined to mean the Architect shall make final determination whether or not substitute materials are an equal to that which is specified. Materials and equipment determined as an "approved equal" and/or substitutions must meet the same construction standards, capacities, code compliances, etc. as the equipment (i.e. Manufacturer, model, etc.) specified.
- C. Approval by Architect for such substitution shall not relieve Mechanical Contractor from responsibility for a satisfactory installation and shall not affect his guarantee covering all parts of work. Architect's decision on acceptability of substitute materials shall be final. Architect's decision on acceptability of substitute materials shall be final.
- D. All materials not specified otherwise shall be manufactured within the United States and supplied locally (within the State of Maine) when available. It is preferable to obtain materials that are manufactured within 500 miles of the work site when practical.
- E. Any additional cost(s) resulting from the substitution of equipment, regardless of acceptance by the Architect or Engineer, shall be the responsibility of Div. 23. Additional costs may include, but not be limited to, electrical and/or structural alterations from the contract documents.

1.11 SHOP DRAWINGS & SUBMITTALS

- A. As soon as possible after award of contract (*but not longer than 21 calendar days*), before any material or equipment is purchased, Mechanical Contractor shall submit shop drawings for review. Unless prior arrangements are made with the Architect all shop drawings must be submitted to the General Contractor who in turn will forward them to the Architect. The quantity of copies shall be as outlined in Division 01. If shop drawings are rejected or returned for re-submittal, Mechanical Contractor shall provide said re-submittals within 14 calendar days of receipt of original submittals with engineer's comments. If original or re-submitted shop drawings are not submitted within the allotted time frames indicated all substitutions included in the late shop drawings will, at the Architect's discretion, be invalid and the equipment primarily specified must be provided. Any costs resulting from delays in the project schedule due to failure to submit shop drawings related to this section in a timely manner shall be the responsibility of the Mechanical Contractor. Mechanical Contractor's and vendor's name, address, telephone number and e-mail addresses shall be provided with every shop drawing submission. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.
- B. Shop drawings shall be properly identified and shall describe in detail the material and equipment to be provided, including all dimensional data, performance data clearly indicated, fan curves, pump curves, computer selection print-outs, etc. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.
- C. Corrections or comments made on the shop drawings do not relieve the contractor from compliance with requirements of the drawings and specifications. Shop drawing review is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction; coordinating his work with that of all



other trades and performing his work in a safe and satisfactory manner.

- D. Should any materials or products be purchased and/or installed without prior review and comment the contractor shall be required to remove or replace those products and/or materials, if directed by the Architect, at his expense. If the materials are not removed (or replaced) or if the project is delayed as a result of the contractor's actions, the Architect reserves the right to order the withholding of payment until the situation is resolved in a manner satisfactory to the Architect. Approved for Code Compliance
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- E. Shop drawings for Divisions 21, 22 and 23 shall be submitted under separate cover or they will be refused for re-submittal. Submittals shall be identified by job title, specification section and paragraph number. Items under each paragraph may be combined into one submittal but do not combine items from multiple paragraphs. For instance, do not combine items specified under par. 2.01 with items specified under par. 2.02.
- F. Shop drawings are required to be submitted electronically (paper copies will not be accepted). Resolution on files in .pdf format shall be a minimum of 300 dpi and a maximum of 600 dpi. Electronic files must be accessible and in an open format, meaning files must not be locked and comments may be added without altering the original content, or have interactive fields intended specifically for commenting. Locked files will not be reviewed. Exception: Color samples, where required, must be provided to the Architect in the form of original paper copies. Electronic color samples are not acceptable due to differences in monitor color rendition. Faxed copies of color samples will be refused.
- G. Review must be obtained on the following items:
1. Ductwork and Accessories
 - a. Registers, diffusers, and grilles
 - b. Duct access doors
 - c. Volume control dampers (manual and automatic)
 - d. Duct sealant
 - e. Fire dampers and sleeves
 - f. Turning vanes
 - g. Side and top takeoff fittings
 - h. Flexible duct
 - i. Backdraft dampers
 - j. Manual dampers
 - k. Wall caps
 - l. Filters
 - m. Vents from gas heating appliances
 2. Mechanical Equipment (sound data must be provided with all interior motorized equipment).
 - a. Full warrantee information must be included with all submittals.
 - b. Air conditioning units and accessories
 - c. Air handling units and accessories - provide curves for fan wheels submitted and computer selection printouts.
 - d. Furnaces



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- e. Compressor / condenser units
- f. Equipment identification tags
- g. Heat recovery ventilator and accessories - provide computer selection printouts.

3. Piping and Accessories

- a. Piping, fittings, unions and flanges
- b. Pipe hangers
- c. Valves
- d. Pipe and valve markers

4. Insulation

- a. Duct
- b. Equipment
- c. Pipe
- d. Pipe fittings

5. Qualifications and Certifications

- a. Certification(s) of Testing and Balancing Contractor

6. Automatic Temperature Control (ATC) System

1.12 A. Protection

Use all means necessary to protect heating, ventilating and air conditioning materials before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1.13 AS-BUILT DRAWINGS

Keep in good condition at the job, apart from all other prints used in actual construction, one complete set of all drawings furnished for this job. On this special set of drawings, record *completely and accurately* all differences between the work as actually installed and the design as shown on the drawings. These record drawings must be kept up to date by recording all changes within one week of the time that the changes are authorized. At the completion of the work, this set of drawings shall be delivered to the Architect for the Owner electronically in the form of CAD drawings or .pdf format with markups in red. If a complete record of changes is not made and electronic drawings not provided by the Mechanical Contractor, a record shall be made by the Engineers, and the cost of the record shall be the responsibility of the Mechanical Contractor. Copies of the mechanical CAD drawings (minus professional engineering stamps) may be made available at no cost to the Mechanical Contractor of record if desired. Drawings shall be dated accordingly and clearly identified as "AS-BUILT". See par. 1.09, "ELECTRONIC DRAWINGS AND FILE SHARING" for additional information.



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1.14 MAINTENANCE MANUAL

- A. On completion of this portion of the work, and as a condition of its acceptance, submit for approval two copies of a manual describing the system. Mechanical equipment manuals shall be separate from plumbing manuals. All manuals shall be original copies, not photocopies or they will be refused for re-submittal. Prepare manuals in durable 3-ring binders approximately 8½ inches by 11 inches in size with at least the following:
1. Identification on the front cover and spine stating general nature of the manual.
 2. Neatly typewritten index.
 3. Complete instructions regarding operation and maintenance of all equipment involved.
 4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name, address and telephone number of nearest vendor of parts.
 5. Copy of all guarantees and warranties issued.
 6. Where contents of manuals including manufacturer's catalog pages, clearly indicate the precise item included in this installation and delete, or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.
 7. Copies of signed documentation of factory startup signed by an authorized factory technicians for pumps and boilers.
- B. In addition to above, provide two (2) separate offset style binders properly identified, each containing a copy of all reviewed shop drawings and catalog cuts. These may be incorporated in Maintenance Manuals, if binders are of adequate size. Also, include (2) CD's with all electronic shop drawings and catalog cuts.

1.15 OBJECTIONABLE NOISE AND VIBRATION

Mechanical equipment shall operate without objectionable noise and vibration. Should objectionable noise or vibration be transmitted to any occupied part of the building by apparatus, piping or ducts, as determined by the Architect, the necessary changes eliminating the noise or vibration shall be made by this Mechanical Contractor at no extra cost to the Owner.

1.16 GUARANTEE

This Contractor shall guarantee all materials and workmanship furnished by him or his sub-contractors to be free from all defects for a period of no less than one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner. Any additional costs required to extend manufacturer's guarantee and warranty for the period specified, shall be included in Contractor's base bid.

1.17 DEVIATIONS AND DISCREPANCIES

- A. The drawings are intended to indicate only diagrammatically the extent, general character and approximate locations of mechanical work. Work indicated, but having minor details obviously omitted, shall be furnished complete to perform the functions intended without additional cost to the Owner. Follow the architectural, structural, plumbing and electrical drawings so that work under this section is properly installed and coordinated with other



Sections.

- B. The drawings and specifications are complimentary to each other and what is called for in one, shall be as binding as if called for by both. In the event of conflicting information on Div. 23 drawings, or between Div. 23 drawings and this specification notify the Architect immediately so a clarification may be issued by addenda.
- C. Questions to the Architect or Engineers are encouraged, however any answers and/or advice is non-binding unless incorporated into the contract documents in the form of addenda, change order, etc. Inquiries requiring an answer prior to opening of bids should be made at least 4 days prior to when bids are due to allow time for a clarifying addendum to be issued.
- D. Any conflicts arising from duplication of equipment specified in different portions of the specifications shall be brought to the attention of the Architect prior to submitting bids. Failure to do so does not relieve the Contractor from responsibility of providing said materials and equipment and a credit will be taken for the duplicated item(s).
- E. Should unforeseen job conditions require re-arrangement of piping and/or ductwork resulting in deviation from the intent of the contract documents or potentially compromising the integrity of the mechanical systems, the Architect shall be notified immediately prior to commencement of work. Failure to do so will result in the contractor being responsible to correct any work installed that is contrary to the contract documents at his own expense.

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1.18 CHANGE ORDERS

- A. No change shall be made from the work, equipment, or materials under this section except as directed in writing by Engineer.
- B. All requests for change in contract price and scope shall be accompanied by a breakdown list of materials with unit and extended prices and labor hours with unit and extended price, plus markups that have been applied.

1.19 COORDINATION

- A. Contractor shall be responsible to coordinate his work with that of other trades to adjust to field conditions prior to commencing work. It is also this contractor's responsibility to coordinate locations of his own piping and ductwork to ensure the two do not conflict. If a reasonable solution cannot be achieved without compromising the integrity of the intended design or would result in additional cost the Architect must be notified immediately prior to commencement of work. Failure to do so does not relieve the Contractor from providing and installing the systems to the satisfaction of the Architect at no additional cost.
- B. Contractor shall be responsible to review job conditions and identify conflicts and/or obstructions to ductwork and piping prior to fabrication. If conflicts and/or obstructions are noted the Architect must be notified immediately prior to commencement of work. The cost of any fabrication work performed without confirmation and notification of conflicts and/or obstructions shall be the responsibility of the contractor.



1.20 REQUESTS FOR INFORMATION

Requests for Information (RFI) or other correspondences which are submitted electronically must be in an open format, meaning files must not be locked and comments may be added without altering the original content, or have interactive fields intended specifically for commenting. No software other than Microsoft Word, Microsoft Excel and Adobe Acrobat Standard shall be required to open files or make comments.

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1.21 WORKPLACE SAFETY

Mechanical contractor shall be responsible for the safety of his workpeople.



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PART 2 - PRODUCTS

2.1 PIPING

A. General

Provide and erect in accordance with best practice of trade all refrigerant and condensate drain piping shown on the plans and as required to complete intended installation. Contractor shall make offsets as shown or required to place all piping in proper position to avoid other work, and to allow application of insulation and finish painting.

B. Pipe Materials:

- | | | |
|----|-------------------------------------|--|
| 1. | Condensate drains from Air Handlers | Schedule 40 PVC with socket joints.
ASTM-A-2665 |
| 2. | Refrigerant | Type "K" hard drawn or copper tubing mains and ACR copper tube |

C. Pipe Fittings:

- | | | |
|----|-------------|--|
| 1. | PVC | Standard DWV fittings with glued connections. ASTM-A-2665 |
| 2. | Refrigerant | Cast bronze or wrought copper, long radius elbows, brazed. |

2.2 HANGERS AND SUPPORTS

A. General

1. All hangers and supports shall be specially manufactured for that purpose and shall be the pattern, design and capacity required for the location of use.
2. Piping specified shall not be supported from piping of other trades.
3. Hangers on PVC piping shall be sized for the piping only. Hangers on refrigerant piping shall be sized to include the insulation and include thermal hanger shields (insulated pipe supports).

Hangers for refrigerant pipe shall be steel, band type, copper plated. Carpenter & Paterson, Inc., Fig. 1A CT or approved equal.

Hangers for PVC piping shall be steel, band type; plastic coated. Carpenter & Paterson, Inc., Fig. 1A PVC or approved equal. Riser clamps shall be Carpenter & Patterson, Inc. Fig. 126 PVC.

4. Thermal hanger shields shall be Carpenter & Paterson, Inc., Fig. 265P or approved equal.



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5. Piping suspended from walls, trench walls and partitions shall be supported by steel support bracket. Carpenter & Paterson, Inc., Fig. 69 or approved equal.

B. Hanger Rods

1. Hanger rods shall be galvanized all thread rod. Rod size shall be as follows:

<u>Pipe Size</u>	<u>Rod Size</u>
1/2" to 2"	3/8"

2. Provide toggle bolts for fastening to concrete blocks and compound anchor shields for bolts for fastening to poured concrete.
3. Provide lag points with rod couplings or side beam connectors with drive screws for fastening to wood.
4. All nuts for hanger rod to be stainless steel.

C. Supports

Provide and install angle iron supports for pipe hangers as required. Angle iron supports shall be adequate size for span and piping or equipment load.

2.3 VALVES

A. General

1. Valves shall be provided as shown and as required to make the installation and its apparatus complete in operation, locate to permit easy operation, replacement and repair. All pressures specified are steam working pressure.
2. Ball valves shall be installed on refrigerant piping connections at every air handler and evaporator coil.
3. All valves to comply with federal specifications and be so listed.

B. Types and Manufacturers

Ball valves for refrigerant piping shall be full port, UL listed 891N, R-410A compatible. Body and cap seal shall be forged brass, 700 psig working pressure and -40°F. to 325°F. temperature range. Seals and gaskets shall be Teflon (no synthetic O-rings). Seal cap design shall permit valve operation without removal of seal cap. Valves shall include an integral Schrader Valve. Connections shall be flare type. Diamondback BV-Series or approved equal.



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2.4 FIRE SEALING

A. Material

Sealant material shall be 3M brand fire barrier caulk CP25 or putty 303, Ciba-Geigy CS240 Firestop Sealant, or approved equal and shall be U.L. listed.

B. Ductwork

Voids between ductwork and fire rated walls/floors shall be sealed fire and smoke tight by this contractor.

2.5 REFRIGERANT SPECIALTIES

A. Sight glass and moisture indicator shall be provided in the liquid line at the evaporator coil and at each compressor-condenser unit if not provided by the equipment manufacturer.

B. Externally equalized expansion valve shall be installed on each liquid connection to the evaporator coil(s) if not provided by the evaporator manufacturer. Valve size shall be as verified with unit manufacturer based on actual length of piping, quantity of fittings and difference of elevation. Valve shall be manufactured by ALCO or Sporlan and installed in accordance with manufacturer's instructions.

C. A complete charge of R-410A shall be provided for the system.

D. The liquid line shall be provided with removable core type filter-dryer and refrigerant valves as shown on the drawings. Units to be provided with ¼ inch male pipe plug in flange plate for installation of charging valve. Units to be Sporlan for refrigerant R-401A or approved equal.

E. Suction and liquid refrigerant piping shall be provided and installed. The refrigerant piping shall be run in an approved manner providing traps where necessary to maintain the proper gas velocities and to keep the system free of oil.

F. Provide a ball valve on each refrigerant line at each air handler.

2.6 CONDENSING FURNACES F-1AND COOLING COILS CC-1

A. General

Provide and install high efficiency, direct vent, condensing gas furnaces where shown on drawings. Capacities shall be as scheduled. Fuel shall be liquid propane gas with capacities shall be as scheduled. Units shall have complete front service access.

B. Cabinet

Heavy gauge steel and "wraparound" cabinet construction shall be used with baked on enamel finish. The heat exchanger section shall be completely lined with foil-faced fiberglass insulation.

C. Blower



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Blowers shall be direct drive with sufficient airflow range for required heating and cooling requirements and shall switch from heating to cooling speeds on demand from room thermostats. The blower door safety switch shall prevent or terminate furnace operation when the blower door is removed.

D. Furnaces

Furnaces shall employ a hot surface ignition system. Units shall be convertible for horizontal use. Furnaces shall include a low energy power venter and vent proving differential switch. Units shall be certified to ANSI Z21.47 / CSA 2.3 for both natural and L.P. gas. Limit setting and rating data shall be established and approved under standard rating conditions using American National Standards Institute standards. Heat exchanger shall be cycle tested, heavy gauge aluminized steel with stainless steel secondary heat exchanger. Combustion air shall be drawn directly from outdoors with no use of room air. Burners shall be multi-port, in-slot style, convertible to L.P. gas without changing burners.

A concentric vent kit shall be furnished from the manufacturer for vertical termination above a sloped roof. Kits shall be sized for the equipment supplied and include roof flashing boots and a gooseneck on the air intake. Material shall be PVC pipe. Extend above roof as high as required by applicable codes but not less than 24 inches above the roof surface.

E. Cooling Coil Sections

Coil sections shall be convertible from upflow to horizontal operation. Coils shall be 3/8" seamless aluminum tubing mechanically bonded to aluminum plate fin. Refrigerant for the coils shall be controlled with factory installed Non-Bleed refrigerant control. Refrigerant connections shall be brazed fittings with an additional Schrader Valve for system service.

The coil cabinet shall have a removable front and interior access panel for evaporator coil entering air surface cleaning. Coils shall include a drain in pan with drain connections for horizontal operation. Coils shall be A.R.I. certified with manufacturer's matching condensing units. Provide Evaporator Defrost Control on AH-2 for lower ambient operating conditions.

F. Controls

The integrated system control lights the main burners upon a demand for heat from the room thermostat. The system shall have solid state devices which continuously monitor for presence of flame when the system is in the heating mode of operation. A slow opening, dual solenoid combination gas valve and regulator shall be provided.

Controls shall include wired, remote thermostats, programmable for two occupied/unoccupied periods per day, seven day settings.



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Controls shall provide total control of furnace limit sensors, blowers, gas valve, flame control and includes self diagnostics for ease of service. The built-in, selectable Cooling/Fan/Off feature shall provide timer delay capability.

2.7 CONDENSING UNITS CU-1

- A. Provide and install outdoor, pad mounted, compressor/condenser units where shown on drawings. Capacities shall be as scheduled.
- B. Units shall be of the same manufacturer as the indoor air handling units and be designed to function with the evaporator coils.
- C. Units shall be fully charged from the factory for up to 15 feet of piping. Units shall be designed to operate at outdoor ambient temperatures as high as 115°F. Cooling capacities shall be AHRI certified when matched to the indoor evaporator coils. Units shall be certified to UL 1995.
- D. Unit casings shall be constructed of heavy gauge, G60 galvanized steel and painted with a weather resistant powder paint on all louvered panels and pre-paint on all other panels. corrosion and weatherproof CMBP-G30 base.
- E. Refrigerant controls include condenser fan, compressor contactor and high pressure switch. High and low pressure controls shall be inherent to the compressor. A factory supplied liquid line drier shall be standard.
- F. Compressors shall feature internal over temperature, pressure protection and total dipped hermetic motor. A centrifugal oil pump and low vibration and noise shall be standard.
- G. The outdoor coil shall provide low airflow resistance and efficient heat transfer. Coils shall be protected on all four sides by louvered panels.
- H. Units shall be Trane compressor/condenser units. Similar equipment meeting the requirements of the specification and drawing will be considered.

2.8 ENERGY RECOVERY VENTILATOR ERV-1

- A. Provide and install, where shown, an air to air heat recovery ventilator with capacities and performance as scheduled Mechanical Drawings. Unit shall be Listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers.

Unit shall have the capacity to operate continuously without the need for bypass, recirculation, pre-heaters or defrost cycles under normal operating conditions.

- B. Energy Recovery Core

The energy recovery core shall be third party Certified by AHRI under its Standard 1060 for Energy Recovery Ventilators. AHRI published certifications shall confirm manufacture's published performance for airflow, static pressure, temperature and total effectiveness, purge air (OACF) and exhaust air leakage (EATR). Products that are not currently AHRI Certified will not be accepted.



Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA 90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.

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The core shall be capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

The core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be permitted.

Water vapor transfer shall be through molecular transport by hydroscopic resin and shall not be accomplished by “porous plate” mechanisms. Exhaust and fresh airstreams shall travel at all times in separate passages, and airstreams shall not mix.

Airflow through the core shall be laminar over the products entire operating airflow range, avoiding deposition of particulates on the interior of the energy exchange plate material.

The core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two years from the date of purchase.

C. Construction

The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.

No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.

The unit case shall be constructed of G90 galvanized, 20-gauge steel, with lapped corners and zinc plated screw fasteners. Provide double wall construction with 24-gauge galvanized steel liner. Provide unit and duct connection orientation per project schedule.

Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets. Pressure taps, with captive plugs, shall be provided allowing cross-core pressure measurement allowing for accurate airflow measurement.

Case walls and doors shall be insulated with 1 inch, 4 pound density, foil/scrim faced, high-density fiberglass board insulation, providing a cleanable surface and eliminating the possibility of exposing the fresh air to glass fibers, and with minimum R-value of 4.3



(hr·ft²·°F/BTU). Case walls and doors shall be insulated with 7/8 inch, expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.

The ERV cores shall be protected by a MERV-8 rated, 2 inch nominal, pleated, disposable filter in both airstreams.

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Unit shall have single-point power connection with a factory installed disconnect switch and a single-point 24 VAC contactor control connection.

Blower motors shall be ECM controlled motors allowing variable speed operation with a 0-10 volt DC control signal. Blowers shall be quiet running.

The unit electrical box shall include a factory installed, non-fused disconnect switch and a 24 VAC, Class II transformer/relay package.

Provide factory installed isolation dampers for intake and exhaust air streams between the unit and louvers. The dampers shall be insulated and of a low leakage design and shall not restrict the airstream, reducing airflow, in any way. The dampers shall be gravity operated backdraft dampers

D. Controls

Unit shall have internal controls. Provide a start/stop (occupied/unoccupied) switch internally. Unit shall monitor discharge temperature and should it fall below 40°F.

E. Unit shall be a packaged unit as manufactured by RenewAire, and shall transfer both heat and humidity using static plate core technology. Similar equipment meeting the requirements of the specification and drawings will be considered.

2.9 SHEETMETAL

A. General

The work under this section includes all the required sheetmetal and duct work, extensions for grilles, manual dampers, automatic counterbalanced (backdraft) dampers, deflectors, setting of control dampers, grilles, registers, diffusers, flexible connections, fire dampers, and louvers, as shown on the drawings or required to make the installation complete in accordance with the intent of the drawings and specifications.

B. Ducts

1. The size of ducts marked on the drawings will be adhered to as closely as possible. The right is reserved to vary duct sizes to accommodate structural conditions during the progress of the work without additional cost to the Owners. The duct layout is schematic to indicate size and general arrangement only. All ducts shall be arranged to adjust to "field conditions". The Sheet Metal Contractor shall coordinate his work with Division 26 and other trades.

2. Medium and low pressure ducts shall be constructed of galvanized steel in



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accordance with the following table of duct sizes OR the latest SMACNA HVAC Duct Construction Standards for Metal and Flexible Duct unless otherwise shown on drawings.

<u>Dimensions of Longest Side</u> (inches)	<u>Minimum Sheet</u> <u>Metal Gauge</u>
Up thru 12	26
13 --> 30	24

3. Methods of fabrication and installation shall be in strict accordance with guidelines set forth in the latest SMACNA Guide and Data Book for Low and Medium Pressure Duct Construction unless otherwise shown on drawings. Cross break all ducts with largest dimension being 18 inches and larger. Beaded ducts are not acceptable except for ductwork less than 18 inches in either direction.
4. All dampers and deflectors shall be a minimum of #22 gauge and stiffened as required. Splitter dampers shall not be acceptable.
5. All joints in ducts shall be made air tight, and all branches and turns shall be made with long radius elbows and fittings. Long radius elbows are defined as having a centerline radius of 1½ times the width of the duct.

If long radius elbows in square or rectangular ducts are shown but not possible due to job conditions, consult the Architect prior to continuing. Upon approval to use square elbows, elbows 18 inches wide and larger shall be provided with fixed double wall airfoil turning vanes designed to reduce the resistance of the elbow to the equivalent of a long radius elbow with a throat radius of not less than duct width. Square elbows less than 18 inches wide shall be provided with single wall turning vanes. Square elbows with outside corners cut at 45° or rounded are not acceptable.

6. All ducts shall be installed with necessary offsets, changes in cross sections, risers, and drops which may be required. They shall be constructed with approved joints and be supported in an approved manner.
7. Unless specifically indicated not to, round ductwork may be substituted for rectangular if desired. The internal cross sectional area shall be not less than 95% of the cross sectional area of the rectangular duct it is replacing. Round ductwork shall be constructed in accordance with the latest SMACNA HVAC Duct Construction Standards for round and oval duct construction. Ductwork larger than 8 inches in diameter shall employ spiral seams. All turns shall be made with smooth (not segmented), long radius elbows and fittings. All seams shall be type RL-5, grooved seam pipe lock or better. *Lap seams are not permissible*. Gauge thicknesses shall be as outlined in SMACNA for galvanized steel round duct gauge selections for maximum 2 inches w.g. static pressure. Ductwork shall be supported with full wrap-around band and single hanger strap as indicated in Figure 4-4 of the 1985 edition of the SMACNA HVAC Duct Construction Standards handbook.
8. Furnish and install flexible connections on ducted air handlers and HRV unit. Connections shall be made from Ventglas neoprene coated glass fabric as



furnished by Ventfabrics, Inc., or approved equal.

9. Every precaution shall be taken to keep interior of duct system free from dirt and rubbish and to protect all ducts and equipment during construction. At completion, this Mechanical Contractor shall thoroughly clean all equipment to the satisfaction of the Architect. Reviewed for Code Compliance
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10. Spaces between ducts and wall or floor construction shall be caulked to make smoke and water tight by this section. Sealant material shall be 3M brand fire barrier caulk CP25 or putty 303, Ciba-Geigy CS240 Firestop Sealant or approved equal.
11. Testing, Balancing and Leak Testing... See Part 3, EXECUTION
12. Requirements set forth in applicable codes (see part one) shall supersede SMACNA standards.

C. Diffusers, Grilles and Registers

1. Grilles and/or registers shall be installed at all air supply, relief, return and exhaust openings as shown. All units to be steel, except as noted, and provided with baked enamel finish to match color of grille or register and countersunk screw holes. Mounting screws shall be oval head type with head painted to match finish. Unless stated otherwise, the following list is based on model numbers of Price to establish a standard of quality (if substituting, certified sound criteria shall be included with submittals indicating CFM and NC levels of each register and grille). Anemostat, Krueger, Metalaire and Tituis only will also be considered for review.
 - a. Supply Registers: Double deflection; with opposed blade damper and $\frac{3}{4}$ inch front blade spacing; front blades set horizontal.
 - b. Exhaust and Return Registers: with opposed blade damper and $\frac{3}{4}$ inch blade spacing, 35° front blade angle, front blades set horizontal.
 - c. Exhaust, Return and Transfer Grilles: without damper, $\frac{3}{4}$ inch blade spacing, 35° front blade angle, front blades set horizontal.

All lay-in registers and grilles shall be supported directly to building structure with no less than two (2) safety chains located at opposing corners.

2. Diffusers shall be installed at all air supply openings as shown. All units to be steel, except as noted, and provided with white baked enamel finish. Unless stated otherwise, the following list is based on model numbers of Price to establish a standard of quality (if substituting, certified sound criteria shall be included with submittals indicating CFM and NC levels of each diffuser). Anemostat, Krueger, Metalaire and Titus only will also be considered for review.
 - a. Square face, 4 way discharge with rectangular duct connection

All lay-in diffusers shall be supported to building structure with no less than two (2) safety chains located at opposing corners.



D. Sealing of Ducts

All ductwork shall be sealed with low VOC water based duct mastic, either "MP" (Multi-Purpose), Carlisle Hardcast "Iron-grip 601", Polymer Adhesive "Airseal #11", or United Duct Seal (United McGill Corp.) water base, latex or acrylic type sealant. All transverse joints to be continuously sealed. Note that, except as noted, oil or solvent based sealants are specifically prohibited for use on this project.

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An approved alternative to mastic is VentureTape 1580 Mastiktape. Material shall be a printed 2.0 mil annealed aluminum foil coated with a heavy application of mastik adhesive. Material shall be UL181B-FX listed foil tape. Material shall span joints by not less than 1 inch on each side of the joint. It is acceptable to overlap by not less than ½ inch if wider applications are necessary. Ensure ductwork is clean of debris and dust prior to applying the tape. Duct tape in any other form or material is strictly prohibited.

All ductwork connected to louvers in exterior walls shall be internally lined with self adhesive ice and water shield as is used on roofing. Liner shall extend across the bottom and half-way up each side of the duct. Liner shall extend 24 inches into the building. Seal all connections between louvers and ductwork with waterproof caulking.

E. Duct Sleeves

Provide aluminum duct sleeves through outside wall at all locations as shown on drawings.

F. Duct Access Doors

Hinged insulated access doors with seals shall be provided in ducts where indicated on drawings, or as required. Units shall be provided at each motor operated damper and fire damper unless accessible through grilles and as shown on drawings. Units to be Ruskin Model ADH-22 for rectangular duct and Model ADR for round duct or approved equal by Elmdor.

G. Motor Operated Dampers

Motor operated control dampers mounted in ductwork shall be provided with the HRV and installed by this Contractor. Contractor shall seal dampers to ductwork to provide a completely waterproof and airtight seal between damper frames and ductwork.

H. Manual Dampers

1. See Part 3, EXECUTION for installation notes.
2. Manual dampers with smallest dimension 5 inches or less shall be shop fabricated, single 22 gauge blade, 3/8 inch rod, provided with position indicator and locking quadrant.
3. Manual dampers with smallest dimension larger than 5 inches but smaller than 11 inches shall be single blade steel, 16 gauge construction, provided with position indicator and locking quadrant. Unit shall be Ruskin Type MD35 or approved equal.



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4. Manual dampers with smallest dimension larger than 11 inches shall be opposed blade steel, 16 gauge construction, linkage concealed in frame, provided with position indicator and locking quadrant. Unit shall be Ruskin Type MD35 or approved equal.
5. Provide hand quadrants for all manual dampers, Ventline Model 560 or approved equal.

I. Fire Dampers

1. Fire dampers shall be installed to comply with NFPA Code No. 90A and shall bear a U.L. label. Provide fire rated access door at each fire damper not accessible through grille. All dampers shall comply with UL requirements for static testing and positive closure under air flow. Dampers in ductwork (not behind a grille or register) shall be dynamically rated.
2. All fire dampers to be provided by damper manufacturer with integral sleeves and mounting angles. Sleeves shall be either one piece, continuous with the dampers fitted inside or factory sealed joints to prevent air leakage. Models indicated are Ruskin to establish a standard:
 - a. Wall and floor types for rectangular ductwork, Model DIBD20, DIBD40 or DIBD60; Type "A" for ducts with the smallest dimension larger than 12 inches and Type "B" for ducts with the largest dimension 12 inches and less.
 - b. Wall and floor type with integral sleeve type for round ductwork, Model FDR25.
 - c. Wall and Ceiling type behind registers and grilles; Model IBDT, Style G.
3. Provide factory mounted fusible links designed to melt at 165°F. and close the damper.
4. Installation shall be in accordance with damper manufacturer's instructions.

J. Flexible Duct

Provide and install insulated flexible duct where shown on drawings. Ducts 20 inches in diameter and smaller shall be a double lamination of polyester encapsulating a steel wire helix forming an air-tight inner core. The core shall be wrapped in a blanket of fiberglass insulation (R 4.2) and sheathed in a rugged and durable reinforced metallized polyester jacket. Duct shall be class 1, U.L. 181 compliant and rated for not less than 2 inches w.g. positive working pressure. Duct internal diameter shall be same size as diffuser served. Atco UPC 030 or approved equal.

K. Side and top Takeoff Fittings (for flexible duct)

Provide and install, at all flexible duct branches to diffusers, a bellmouth side takeoff fitting similar to detail on drawing M2, "*Flexible Duct and Diffuser Connection Detail*"; with or without manual damper (some dampers to be added downstream - see plans). Fittings shall be pre-manufactured with bell end shall have a 1½ inch radius and employ a self-adhesive gasket seal and be pre-drilled for attachment screws. Units with manual dampers shall be



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heavy duty with bearings and hand quadrants. Fittings shall be anchored to ductwork with not less than three (3) screws. Final diameter shall be same size as diffuser served. Units shall be no thinner than 22 gauge, G-90 galvanized steel. Buckley Bellmouth HD-BM, HD-BMD or approved equal by Flexmaster or United Enertech.

L. Turning Vanes

1. Provide and install at all square duct elbows 18 inches and larger, and where shown on drawings, fixed double wall airfoil type turning vanes. Turning vanes shall be constructed as outlined in the latest SMACNA HVAC Duct Construction Standards guidebook, Figure 2-3.
2. Provide and install at all square duct elbows less than 18 inches in width, and where shown on drawings, fixed single wall turning vanes. Turning vanes shall be constructed as outlined in the latest SMACNA HVAC Duct Construction Standards guidebook, Figure 2-3.

2.10 FILTERS

All air handling units and HRV shall be provided with a minimum of three (3) sets of filters with pleated media. One set to be used during construction (and replaced by the Mechanical Contractor during construction if required as determined by the Clerk of the Works and/or the Mechanical Engineer). Second set to be installed a minimum of one (1) day and a maximum of three (3) days prior to testing and balancing and/or final inspection. The third set shall be turned over to the Owner in their original unopened shipping boxes for their future use.

Filters shall be Farr 30/30, Air Guard DP-40 or approved equal; 1 inch thick for unit ventilators, fan coil units, variable air volume units and cabinet unit heaters; 2 inches thick for all other units.

2.11 PIPE AND EQUIPMENT IDENTIFICATION

Tag each air handler, condensing unit and HRV with rectangular engraved nameplates with white letters on black, Brady Corp., Seton Name Plate Corp. or approved equals. Nameplates shall be mechanically fastened to equipment (adhesives are not acceptable). Embossed labels are not acceptable.

Nameplates shall be 4 inches by 1½ inches, Setonply Style No. M1774. On all other units nameplates shall be 2½ inches by ¾ inch, Setonply Style No. M1771.

Identify all refrigerant and drain piping with "Set Mark" full snap-around pipe markers by Seton Name Plate Corporation or approved equal by Brady Corp. Markers shall include both identification and direction of flow. Markers shall be no greater than 10 feet apart except in mechanical spaces where they shall be not greater than 20 feet apart. Markings and colors shall be per the following chart:



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Marking	Background Color	Lettering Color
Refrigerant Liquid	Green	White
Refrigerant Suction	Green	White
Drain	Green	White

2.12 INSULATION AND CONDENSATE PROTECTION

A. General

1. Insulation shall be provided for all refrigerant suction piping), outside air intakes, supply ducts, exhaust and relief ducts and other insulation where shown on drawings.
2. All insulation products shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less per ASTM E 84, UL 723 and NFPA 255.

B. Refrigerant Piping

1. Refrigerant piping (not pre-insulated by equipment manufacturer) shall be insulated with flexible, closed cell elastomeric thermal insulation. Material shall be 25/50 rated (flame spread rating of 25 or less and smoke developed rating of 50 or less) when tested in accordance with ASTM E84, latest revision. Thickness shall be 1 inch on refrigerant piping and ½ inch on PEX tubing.
2. Piping and fittings exposed to the elements shall have the insulation covered with ultraviolet resistant vinyl outdoor PVC jacket, JohnsManville Zeston 300 or approved equal.
3. Materials shall have a maximum thermal conductivity of 0.27 Btu-in./h-ft²-°F at a 75°F mean temperature when tested in accordance with ASTM C177 or ASTM C 518, latest revisions.
4. Materials shall have a maximum water vapor transmission of 0.08 perm inches when tested in accordance with ASTM E 96, Procedure A, latest revision.
5. Adhesive shall be the insulation manufacturer's recommended contact adhesive: Armaflex 520, Armaflex 520 BLV.
6. Accessories such as adhesives, mastics and cements shall have the same properties as listed above and shall not detract from any of the system ratings as specified above.

C. Duct Insulation

1. Duct insulation shall be a ¾ pound density, all-service fiberglass duct wrap with factory applied foil faced FRK vapor barrier facing meeting the requirements of ASTM C 1136, Type II. Insulation material shall meet the requirements of NFPA 90A, NFPA 90B, ASTM C 1290 and ASTM C 553. Operating temperature range shall be from 40°F. to 250°F. Maximum "k" factor of 0.30 at 75°F. mean



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temperature difference. Owens Corning Type 75, Johns Manville Microlite XG or approved equal.

2. Insulate the following with 1½ inches installed thickness fiberglass duct wrap:
 - a. Supply air ducts from and all air handlers.
 - b. All supply and return air ductwork in the mechanical room (air handlers and HRV).
3. Insulate the following ducts with 3 inches installed thickness fiberglass duct wrap:
 - a. Outdoor air and exhaust air ducts between HRV and outside wall.
4. Material to carry U. L. label. All laps to be sealed and held in place with adhesive and flare staples. All lap joints to be folded under before stapling so no raw insulation will be showing. On the bottom of ducts 24 inches or wider, mechanical fasteners shall be provided approximately 12 inches O.C.

D. Condensate Protection

Solder or weld bottom and sides of ducts connected to outdoors to prevent water leaks from rain and snow. Seal duct wrap and liner to minimize condensation.

E. Installation

All insulation work shall be executed by skilled insulation workmen regularly employed in the trade.

2.13 AUTOMATIC TEMPERATURE CONTROL (ATC)

A. General

1. All temperature controls shall be furnished by the manufacturers of the equipment served.
2. Installation shall be by the Mechanical Contractor under supervisions of the equipment manufacturers.
3. Sub contracting of ATC wiring to the Electrician is permissible but the Mechanical contractor shall be ultimately responsible and liable for proper installation as outlined in Divisions 22 and 26 of this specification.
4. Shop drawings of control systems shall be submitted with the equipment to be controlled for review before work is started.
5. Contractor must, at the end of the warranty period, furnish the Owner with all access codes and passwords assigned to the control systems. ATC Contractor shall also instruct the Owner in the use of all digital control software and provide a backup copy of the final software package to the Owner on CD.

B. Incidental Work by Others



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1. The following incidental work shall be furnished by the designated contractor under the supervision of the Control Contractor.

a. Sheet Metal Contractor shall:

- (1) Install all automatic dampers.
- (2) Provide necessary blank-off plates required to install dampers that are smaller than duct size.
- (3) Assemble multiple section dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper motors.
- (4) Provide access doors or other approved means of access through ducts for service to control equipment.

b. The General Contractor shall:

- (1) Provide all necessary cutting, patching and painting.
- (2) Provide access doors or other approved means of access through ceilings and walls for service to control equipment.

c. Division 26 shall:

- (1) Wire power to all motor operated dampers.
- (2) Provide circuit breaker(s) as needed for low voltage transformers.

C. Electric Wiring

1. All low voltage and data wiring for installation of temperature controls shall be by ATC Contractor, except as noted. Power wiring for equipment shall be by Division 26, "ELECTRICAL". See Part 1, Paragraph 1.03, sub-paragraph C, "MECHANICAL ELECTRICAL WORK" for specific requirements. Exception: Power wiring from circuit breaker to temperature control panel(s) will be provided and installed by the ATC Contractor.
2. ATC Contractor shall be responsible for coordinating installation of his wiring conduits with Division 26, "ELECTRICAL".

D. Instruction and Adjustment

Upon completion of the project, after the ATC systems have been commissioned and are functioning as intended, the Mechanical Contractor shall:

1. Adjust for use by Owner, all thermostats, controllers, damper operators, and relays provided under this section.
2. Prior to training, furnish two (2) copies of reviewed shop drawings and instruction manuals covering function and operation of control systems for use of the Owner's operating personnel. These shall include manuals of all controls installed and/or wired by the ATC Contractor even if they were provided by different vendors (pumps, boilers, etc.).



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3. A competent technician who was involved in the actual installation of the ATC systems shall be provided to thoroughly instruct the Owner's Representative(s) in the care and operation of the ATC system. A representative of the Mechanical Contractor shall also be in attendance through all training. The total period of instruction shall not exceed one (1) hour. This instruction shall be in addition to instructions for equipment and systems not included in the ATC portion of this project. See par. 3.09, "INSTRUCTIONS". Date and time of instruction shall be arranged with the Owner.

E. Guarantee

Control system shall be guaranteed to be free from original defects in both material and workmanship for a period of not less than one (1) year of normal use and service. This guarantee shall become effective starting the date Architect agrees Owner has begun to receive beneficial use of the system.

F. Hazardous Materials

Mercury, or any other material deemed hazardous by the Federal Environmental Protection Agency or the State of Maine Department of Environmental Protection, shall not be used in any components of the ATC system.

G. Thermostats

Thermostats shall be provided by the manufacturer of the equipment to be controlled.

H. Description of Operation

1. Refer to Mechanical Notes on Drawings



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PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all work is complete to the point where this installation may properly commence.
2. Verify that Mechanical systems may be installed in strict accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies

1. In the event of discrepancy, immediately notify Architect.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION OF PIPING AND EQUIPMENT

A. General

1. All drain piping shall be installed within building insulation.
2. Size and general arrangements as well as methods of connecting all piping, valves, and equipment shall be as indicated, or to meet requirements for complete installation.
3. All pumps shall be supported independently of the piping system.
4. All piping shall be erected to provide for easy and noiseless passage of refrigerant all working conditions.
5. All condensate drains shall be graded downward in the direction of flow a minimum of 1 inch in 10 feet of run.
6. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective materials from the job site.
7. Install pipes to clear all beams and obstructions; do not cut into or reduce the size of load carrying members without the approval of the Architect.
8. All risers and offsets shall be substantially supported.



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9. Maximum spacing of hangers for copper and PVC piping shall be as follows:

<u>Pipe Size</u>	<u>Spacing</u>
½", ¾" & 1"	6'-0"
1¼" & 1½"	6'-0"
2" & 3"	8'-0"

B. Joints and Connections

1. Smoothly ream all cut pipe; cut all threads straight and true. Apply PVC primer and cement to PVC pipe fittings.
2. All joints in refrigerant tubing shall be brazed.

3.3 INSTALLATION OF DUCTWORK AND EQUIPMENT

A. General

1. Size and general arrangements as well as methods of connecting all diffusers, registers, grilles, duct coils and equipment shall be as indicated, or to meet requirements for complete installation.
2. Construction standards and sheet metal gauges shall be as outlined in the latest edition of the SMACNA HVAC Duct Construction Standards handbook for metal and flexible ducts unless specifically indicated otherwise.
3. Do not use segmented elbows or screws to connect fittings on clothes dryer ducts. Use smooth, long radius elbows and pop rivets instead.
4. Do not use square elbows for offsets that are show utilizing radius elbows (or partial radius elbows) without permission from the Engineer.
5. Manual Dampers
 - a. Manual dampers may be shop-fabricated on units 5 inches in height and less. All dampers larger than 5 inches MUST be pre-fabricated as previously outlined in this specification.
 - b. All manual dampers located within 10 feet of a fan outlet shall have the blades oriented perpendicular to the fan shaft.
 - c. Provide duct access door as large as possible up to 12 inches x 12 inches at each manual damper larger than 5 inches.

B. Protection and Cleaning

1. All open ends of ductwork which is to be unattended for 4 hours or more shall be temporarily protected with plastic sheeting and duct tape (or similar method) to reduce the collection of construction dust and debris.



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2. Prior to testing and balancing and at the end of the construction, clean the interiors of all supply and return air ductwork before changing filters in air handling equipment. Careful coordination must be maintained between the time of testing and balancing and final delivery to avoid re-accumulation of dust and debris within the duct systems which will require additional cleaning by the Mechanical Contractor.

3.4 TESTING, ADJUSTING AND BALANCING (TAB)

A. General

1. TAB contractor shall be a subcontractor to the Mechanical Contractor.
2. The TAB Contractor must provide, for review, contact information and copies of qualifications and certifications through the shop drawing review process. The following is a list of acceptable TAB contractors.
 - a. Central Air Balance
 - b. Maine Air Balance
 - c. Tab-Tech International
 - d. Tekon-Technical Consultants
 - e. Yankee Balancing

No others will be accepted unless pre-approved prior to opening of bids.

3. TAB contractor shall perform functional performance test of all Division 23 equipment and entire ATC system for specified operation and control sequences.
4. The mechanical contractor shall startup all Division 23 equipment as required by the equipment specifications. Mechanical contractor shall verify that systems are complete and operable before TAB commencing work. Ensure the following conditions:
 - a. Systems are started and operating in a safe and normal condition.
 - b. Temperature control systems are installed complete and operable.
 - c. Proper thermal overload protection is in place for electrical equipment.
 - d. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - e. Duct systems are clean of debris.
 - f. Fans are rotating correctly.
 - g. Fire and volume dampers are in place and open.
 - h. Air coil fins are cleaned and combed.
 - i. Access doors are closed and duct end caps are in place.
 - j. Air outlets are installed and connected.
 - k. Duct system leakage is minimized.
5. TAB Contractor shall submit field reports to General Contractor. Report defects and deficiencies noted during performance of services which prevent system testing and balance.
6. TAB contractor shall submit all verification and functional performance



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checklists/results, signed by indicated personnel, organized by system and sub-system.

7. TAB contractor shall submit other reports described below.

B. Work Included

1. Test, adjust and balance all air systems, including components to conform to air flow rates shown on drawings.
2. Test complete automatic temperature control sequences for specified operations described under AUTOMATIC TEMPERATURE CONTROLS.
3. Complete and submit balance report. Report shall be submitted with information noted on one side of sheet only (i.e., backside of sheet shall be blank.).
4. All testing shall be done by the same agency.
5. Mechanical Contractor shall provide copies of shop drawings indicating air handling unit air volumes, etc. to the Testing and Balancing contractor at no cost to the contractor.
6. Careful coordination must be maintained between the time of testing and balancing and final delivery to avoid re-accumulation of dust and debris within the duct systems which will require additional cleaning by the Mechanical Contractor.

C. Quality of Compliance

1. Qualification: TAB Contractor must be independent test and balancing agency.
2. AABC Compliance: Comply with AABC Manual MN-1 "AABC National Standards" as applicable to mechanical and hydronic distribution systems and/or Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
3. Industry Standards: Comply with ASHRAE recommendations for measurements, instruments and testing and balancing.
4. Coordination: Work together with ATC Contractor to adjust set points of various devices to balance system(s) and test control sequences of operation. ATC Contractor shall be responsible for balancing return air, exhaust (relief) air and outdoor air dampers on Air Handling Units in order to achieve proper mixed air temperatures.
5. ASHRAE Guideline 1-1996, "The HVAC Commissioning Process".



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D. Execution of TAB Work

1. TAB Contractor shall visit job site and determine that control devices, test devices and valves are correctly installed and ready for balancing.
2. Examine each air distribution system to see that it is free from obstructions. Determine that all dampers and registers are in a set or full open position; that moving equipment is lubricated, and that required filters are clean and functioning. Request that Installing Contractor perform any adjustments necessary for proper functioning of the system.
3. TAB Contractor shall use test instruments that have been calibrated within a time period recommended by the manufacturer, and have been checked for accuracy prior to start of testing, adjusting and balancing activity.
4. Verify that all equipment performs as specified. Adjust variable type drives, volume dampers, control dampers, balancing valves and control valves as required by TAB work.
5. Test pressure profile of systems by traverse as required.
6. Adjust each register, diffuser terminal unit and damper to handle and properly distribute design airflow within 5% of specified quantities. Mark all setpoints.
7. Adjust front and rear discharge louvers on each supply register to distribute air in an even pattern or as indicated on plans.
8. Adjust air discharge patterns of all supply air diffusers, registers and grilles for optimal air diffusion.
9. Document results of all testing on approved TAB report formats and submit 3 copies for approval and record within 15 days of completion of TAB work. Include a warranty period of 90 days, during which time the Architect/Engineer may request a re-check or re-adjustment of any part of the work.
10. Reports shall be compiled on a spreadsheet such as Excel, Quattro-Pro, Lotus, etc. and shall clearly indicate the following *minimum* information:

Air (Rated and Actual)

- a. System/unit name
- b. HP, BHP, voltage, amperage and fan rpm
- c. Static pressures; suction, discharge and total
- d. Total system flow rate
- e. Individual terminal flow rates (Terminal readings must show location, make, model and size of register, grille or diffuser).
- f. Provide a static pressure profile of all AHU's components in the two extreme operating modes; minimum outdoor air and economizer cycle.
- g. Filter status report

Reports to have a minimum of color or must be compatible with monochrome printers.



Reports must be submitted to the Architect electronically in addition to hard copies.

E. Drawings

Drawings in CAD format may be made available to the TAB Contractor after the contract for this work is awarded. Contact the Engineer and request the drawings, indicating CAD format required and a return e-mail address. See par. 1.09, "ELECTRONIC DRAWINGS AND FILE SHARING" for additional information.

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3.5 CLOSING IN UNINSPECTED WORK & ROUTINE INSPECTIONS

A. General

Do not cover up or enclose work until it has been properly and completely inspected and approved.

B. Contractor is required to provide not less than 48 hours advance notice to the Architect of intent to cover non-inspected work to permit time for scheduling inspections.

C. Noncompliance

Should any work be covered up or enclosed prior to all required inspections and approvals, the Architect reserves the right to order the uninspected work to be uncovered for inspection at the Contractor's expense. After the work has been inspected completely and approved, make all repairs and replacements with materials necessary for approval by the Architect and at no additional cost to the Owner.

3.6 TEMPORARY HEATING

A. Mechanical Contractor shall install the new heating systems and related equipment as soon as those portions of the building are ready and the work can be performed.

B. Mechanical Contractor will be required to permanently connect as many units as possible for temporary heat.

C. At the conclusion of the temporary heating period, the complete system shall be thoroughly cleaned.

D. General Contractor will be required to assume full responsibility for the care and operation of the new equipment during its temporary use and to return the equipment to the Mechanical Contractor in perfect order, normal wear and tear excepted.

E. Water, fuel and electric power required to operate the heating system for temporary heat shall be provided by the General Contractor.



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3.7 CLEANING

Prior to acceptance of the buildings, thoroughly clean all exposed portions of the Heating, Ventilating and Air Conditioning installation, including the removal all labels and all traces of foreign substance. Prior to testing and balancing vacuum and clean inside of all convectors, finned radiators (spackle droppings), unit ventilators, air handling units, VAV units, fans and cabinet unit heaters. Clean the interiors of ductwork as outlined in 3.03, "INSTALLATION OF DUCTWORK AND EQUIPMENT".

3.8 INSTRUCTIONS

On completion of the job, the Mechanical Contractor shall provide a competent technician to thoroughly instruct the Owner's Representative in the care and operation of the system. The total period of instruction shall not exceed one (1) hour. ATC system instruction shall be in addition to this instruction period. See 2.15, "AUTOMATIC TEMPERATURE CONTROL (ATC)", sub-paragraph D, "Instruction and Adjustment". The time of instruction shall be arranged with the Owner.

3.9 REFRIGERANT PIPING

Refrigerant piping shall be installed and tested in accordance to the conditions set forth herein and as required by the manufacturer of the refrigeration equipment by personnel with not less than 5 years experience in the installation of refrigerant piping.

The installation shall be inspected and certified by the manufacturer of the refrigeration equipment prior to charging with refrigerant.

Refrigerant piping shall be run in a approved manner, providing traps where necessary to maintain gas velocities to return oil to the compressor and to keep systems free of oil slugs at the compressor. Fittings shall be long radius and brazed. The inside of all refrigerant piping shall be thoroughly cleaned using Virginia Solvent #10 or approved equal; followed by a wiping of compressor oil and then wiped dry with a clean, dry cloth. All refrigerant piping shall then be tested with nitrogen and all joints tapped with a rubber mallet to make sure they are tight. A soap solution shall then be applied to each joint. High side test shall be a minimum of 250 psi while the low side test shall be tested to a minimum of 100 psi. Any equipment that may be damaged by these pressures shall be removed. After pressure test, a freon test shall be applied using Halide torch. The interior of the piping system shall be thoroughly cleaned of all oil, dirt and foreign matter then evacuated and dehydrated. All copper tubing shall be supported by copper coated clevis type hangers, see Paragraph 2.03; "HANGERS AND SUPPORTS". The hangers on the suction piping shall be sized to include the insulation and metal shields 12 inches long shall be placed between hangers and insulation.

3.10 RECYCLING

Discarded materials, both new and removed, shall be recycled whenever practical through metal salvage dealers (ductwork, piping, etc.), paper salvage (cardboard shipping containers, etc.), wood & plastic products, etc. The Mechanical Contractor shall retain the salvage value of discarded materials and may use this value to offset his project bid price if so desired. Toxic materials such as adhesives, coolants, refrigerants, etc. SHALL be disposed of in a manner acceptable to the State of Maine Department of Environmental Protection.

3.11 HAZARDOUS MATERIALS



Mercury, asbestos or any other material deemed hazardous by the Federal Environmental Protection Agency or the State of Maine Department of Environmental Protection, shall not be used in any components of the mechanical systems.

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SECTION 26 00 00

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

Part One: General

1.1 General Requirements

1.1.1 Definition of Work

Conditions of the Contract, Specifications, Change Orders, Addenda and Drawings apply to work of this section.

1.1.2 Provisions

As used in this section, "provide" means "furnish and install", "furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support and to store in a secure area in accordance with manufacturers instructions", and "install" means "to unload at the delivery point at the site or retrieve from storage, move to point of installation and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project".

1.1.3 Existing Site Conditions – Responsibilities Prior to Bid

Before submitting a bid, the Electrical Subcontractor shall visit and carefully examine site to identify existing conditions and difficulties that may affect the work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions.

1.1.4 Existing Site Conditions – Responsibilities Prior to Starting Work

Before starting work in a particular area of the project, the Electrical Subcontractor shall examine the conditions under which work must be performed including preparatory work performed under other Sections of the Contract, or by the Owner and report conditions which might adversely affect the work in writing to the Engineer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.2 Applicable Codes and Standards

1.2.1 Work

All work shall be in accordance with the laws, rules, codes, and regulations set forth by Local, State, and Federal authorities having jurisdiction. All products and materials shall be manufactured, installed and tested as specified, but not limited to the latest accepted edition of the following codes, standards and regulations:

NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Act
NEC	National Electrical Code (NFPA 70)
UL	Underwriters Laboratory
NESC	National Electrical Safety Code
FM	Factory Mutual Association
MUBEC	Maine Uniform Building Code
Local AHJ	Local and State building, electrical, fire and health department and public safety codes agencies.



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1.2.2 Code Conflicts

When requirements cited in this Paragraph conflict with each other or with Contract Documents, the most stringent requirements shall govern conduct of work. The Engineer may relax this requirement when such relaxation does not violate the ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing. Should the Electrical Subcontractor perform any work that does not comply with the requirements of the applicable building codes, state laws, and industry standards, he shall bear all costs arising in correcting these deficiencies.

1.3 Contract Documents

1.3.1 Work to be Provided

Work to be provided under this division is shown on the electrical drawings listed in Division 1, General Requirements and in these Contract Specifications.

1.3.2 Coordination of Work

The listing of electrical drawings does not limit the responsibility of determining the full extent of work that is required by these contract documents. The Electrical Subcontractor shall refer to the drawings and other specification sections included in the complete Contract Package, that indicate types of construction with which work of this section must be coordinated. The General Contractor shall coordinate the work of all trades including that of the electrical contractor, with all other subcontractors to determine whether there will be any interference with the electrical work. If the Electrical Subcontractor fails to check with the General Contractor and the electrical work is later found to interfere with the work of other subcontractors, then he shall make necessary changes, without additional cost to the Owner, to eliminate such interference.

1.3.3 Intent of Design

Drawings are diagrammatic and indicate the general arrangement of systems and work to be included in the Contract. Information and components shown on riser diagrams or called for in the specifications but not shown on plans, and vice versa, shall apply and shall be provided as though required expressly by both. The contract documents are not intended to indicate and specify each component required, but do require that the components and materials be provided for a complete and operational installation.

1.3.4 Discrepancies in Documents

Each bidder shall be responsible for examining the drawings and specifications carefully before submitting his bid, with particular attention to errors, omissions, conflicts with provisions of laws and codes imposed by authorities having jurisdiction, conflicts between portions of drawings, or between drawings and specifications, and ambiguous definition of the extent of coverage in the contract. Any such discrepancy discovered shall be brought to the immediate attention of the Engineer for correction. Should any of the aforementioned errors, omissions, conflicts or ambiguities exist in either or both the drawings and specifications, the Electrical Subcontractor shall have the same explained and adjusted in writing before signing the contract or proceeding with work. Failure to notify the Engineer in writing of such irregularities prior to signing the Contract will cause the Engineer's interpretation of the Contract Documents to be final. No additional compensation will be approved because of discrepancies thus resolved.

1.3.5 Conflicts with Codes and Regulations

The drawings and these specifications are intended to comply with all the above mentioned Codes, Rules and Regulations. If discrepancies occur, the Electrical Subcontractor shall immediately notify the Engineer in writing of said discrepancies and apply for an interpretation and, unless and

interpretation is offered in writing by the Engineer prior to the execution of the contract, the applicable rules and regulations shall be complied with as a part of the contract.



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Part Two: Scope of Work

2.1 General Requirements

2.1.1 General Scope

The work to be accomplished under these specifications includes providing all labor, materials, equipment, consumable items, supervision, administrative tasks, tests and documentation required to install complete and fully operational electrical systems as described herein and shown on the Drawings.

2.1.2 Administrative Responsibilities

The Electrical Subcontractor shall file plans, obtain permits and licenses, pay fees and obtain necessary inspections and approvals from authorities that have jurisdiction, as required to perform work in accordance with all legal requirements.

2.2 Work to be Provided Under this Division

2.2.1 General Scope

The Work shall be complete from point of service to each outlet or device with all accessory construction and materials required to make each item of equipment or system complete and ready for operation. The work shall include but not be limited to the following. The Electrical Subcontractor shall provide:

- A. **Service Entrance:** The intent is to reuse the existing 120/240V Electrical Service for the garage building and taking a 100A feeder from this panel.
- B. **Grounding System:** Connect to the existing grounding system and furnish all equipment and interconnection wiring as per NEC.
- C. **Power Distribution Systems:** Provide power and lighting distribution systems including panelboard, overcurrent devices, raceway, cable and wire.
- D. **Feeder and Branch Circuit Wiring:** Provide feeder and branch circuits and devices for power to equipment and convenience receptacles. This includes branch wiring to system control panels furnished under other sections.
- E. **Motor Circuit Wiring:** Provide all motor wiring, safety disconnects, and motor starters unless integral with equipment.
- F. **Interior Lighting Systems:** Provide complete interior lighting system including normal and emergency fixtures, exit signs, lamps, controls, trim and accessories.
- G. **Exterior Lighting Systems:** Provide exterior fixture at each door exiting the building into the garage including all controls, lamps and accessories.
- H. **Fire Alarm Systems:** There is no fire alarm scope in this project.



- I. **Telephone and Data Systems:** Provide conduits, device boxes, cables, terminations, and punch-down blocks for installation of Owners IT Equipment.
- J. **Control Wiring:** Provide control wiring not provided by Division 25000.
- K. **Supports and Fittings:** Provide all support material and hardware for raceway, cable tray and electrical equipment.
- L. **Terminations:** Provide terminations of all cable and wire unless otherwise noted.
- M. **Penetrations:** Provide all building wall, floor and roof penetrations for raceway and cable tray where not provided by the General Contractor.
- N. **Other Items Furnished By Others:** Install the following equipment furnished by others:
 - 1. Motors
 - 2. Control Panels

2.3 Work not Included Under this Division

2.3.1 Related Work Included in Other Sections

The following work is not included in this Section and shall be performed under other sections:

- A. Excavation and backfill.
- B. Concrete work, including concrete housekeeping pads and other pads and blocks for vibrating and rotating equipment.
- C. Cutting and patching of masonry, concrete, tile, and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal decks. The Electrical Subcontractor shall identify locations of penetrations, excavations, structural supports, etc. required for the completion of the Work of this Section to the General Contractor in a timely manner.
- D. Installation of access panels in ceilings and wall construction.
- E. Painting, except as specified herein.
- F. Temporary water, heat, gas and sanitary facilities for use during construction and testing.
- G. Outdoor air intake or exhaust louvers.
- H. Control wiring specifically indicated as part of Division 25.



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2.4 General Equipment and Materials Requirements

2.4.1 General Requirements

All equipment and materials shall be new and of the quality specified. All materials shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged during construction shall not be repaired at the jobsite, but shall be replaced with new materials.

2.4.2 Representation of Equipment

All equipment installed on this project shall have local representation, local factory authorized service and a local stock of repair parts.

2.4.3 Warranties

No equipment or material shall be installed in such a manner as to void a manufacturer's warranty. The Electrical Subcontractor shall notify the Engineer of any discrepancies between the Contract Documents and manufacturer's recommendations prior to execution of the work. Refer to Division 1, General Requirements for Warranty Requirements.

2.5 Shop Drawings

2.5.1 General Requirements

After the Contract is awarded, but prior to proceeding with the Work, the Electrical Subcontractor shall obtain complete shop drawings, product data and samples from manufacturers, suppliers, vendors, and Subcontractors for all materials and equipment specified herein, and submit data and details of such materials and equipment for review by the Engineer. [Submission of such items shall follow the guidelines set in the General Section of the Specification Document.] Prior to submission of the shop drawings, product data and samples to the Engineer, the Electrical Subcontractor shall review and certify that the shop drawings, product data and samples are in compliance with the Contract Documents. Further, the Electrical Subcontractor shall check all materials and equipment after their arrival on the jobsite and verify their compliance with the Contract Documents. A minimum period of ten working days, exclusive of transmittal time will be required in the Engineer's office each time shop drawings, product data and/or samples are submitted or resubmitted for review. This time period shall be considered by the Electrical Subcontractor when scheduling his Work.

2.5.2 Information to be included in Submittal

The shop drawing submittal shall include all data necessary for interpretation as well as manufacturer's name and catalog number. Sizes, capacities, colors, etc., specified on the drawings shall be specifically noted or marked on the shop drawings.

2.5.3 Information Not to be included in Submittal

Submittals shall contain only information specific to systems, equipment and materials required by Contract Documents for this Project. Do not submit catalogs that describe products, models, options or accessories, other than those required, unless irrelevant information is marked out or unless relevant information is highlighted clearly. Marks on submittals, whether by Contractor, Subcontractor, manufacturer, etc., shall not be made in red ink. Red is reserved for review process.

2.5.4 Responsibility of Submitted Equipment

The Engineer's review of such drawings shall not relieve the Subcontractor of responsibility for deviations from the Contract, Drawings or Specifications, unless he has in writing called the attention



of the Engineer to such deviations at the time of the submission. The Engineer's review shall not relieve the Electrical Subcontractor from responsibility for errors or omissions in such drawings.

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2.5.5 Proposal of Other Equipment

If the Electrical Subcontractor proposes an item of equipment other than that specified or detailed on the drawings which requires any redesign of the wiring or any other part of the mechanical, electrical or architectural layout, the required changes shall be made at the expense of the trade furnishing the changed equipment at no cost to the Owner.

2.5.6 Substitution of Equipment of Equal Quality

Manufacturer's names are listed herein and on the drawings to establish a standard for quality and design. Where one manufacturer's name is mentioned, products of other manufacturers will be acceptable if, in the opinion of the Engineer the substitute material is of quality equal to or better than that of the material specified. Where two or more manufacturer's names are specified, material shall be by one of the named manufacturers only.

2.6 Equipment Manuals

2.6.1 General Requirements

The Electrical Subcontractor shall provide three copies of operations and maintenance manuals for all items. These manuals shall be packaged with additional information including equipment cur sheets and as-built wiring diagrams. Manuals shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment.

2.6.2 Schedule

Deliver manuals no less than 30 days prior to acceptance of equipment to permit Owner's personnel to become familiar with equipment and operation prior to acceptance.

2.6.3 Instruction of Owner's Operating Personnel

Upon completion of installation or when Owner accepts portions of building and equipment for operational use, instruct the Owner's operating personnel in any and all parts of various systems. Such instructions shall cover period of control such as will take mechanical equipment through complete cycle. Make adjustments under actual operating conditions.

2.7 Record Drawings

2.7.1 General Requirements

As work progresses, and for duration of the Contract, the Electrical Subcontractor shall maintain a complete and separate set of prints of Contract Drawings at job site at all times and record work completed and all changes from original Contract. Drawings shall clearly and accurately include work installed as a modification or added to the original design. At completion of work and prior to final request for payment, the Electrical Subcontractor shall submit a complete set of reproducible record drawings showing all systems as actually installed.

Part Three: Execution

3.1 Wiring Methods

3.1.1 Requirements

Unless otherwise noted all wiring shall be installed in raceway as follows:



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- A. **Power Distribution Outdoors:** All conduit installed outdoors, all risers between floors and conduit exposed to physical damage shall be rigid steel, rigid aluminum or intermediate metal conduit. Wiring installed underground shall be installed in rigid non-metallic, PVC conduit and as per the Contract Drawings.
- B. **Power Distribution Indoors:** Unless otherwise noted, all exposed power distribution wiring including wiring between panelboards shall be installed in electrical metallic tubing (EMT). All other indoor wiring including feeders and branch circuits shall be allowed to be furnished in properly supported MC cable assembly.
- C. **Telephone & Data:** Telephone and Data wiring shall be furnished in 3/4" minimum EMT conduits from devices identified on the plans in spaces between walls and inaccessible ceilings, with the EMT stubbing up a minimum of 6" above the wall and into the ceiling space.
- D. **Fire Alarm System:** Shall be installed in red MC cable assemblies listed for use as fire alarm cable assemblies.
- E. **Security Systems Wiring:** Shall be installed neatly bundled and ty-wrapped and sufficiently supported by j-hooks or cable trays above accessible hung ceiling spaces, and in 3/4" minimum EMT conduits between walls, with the EMT stubbing up a minimum of 6" above the wall and into the ceiling space.

3.2 Work in Existing Facilities

3.2.1 Requirements

All construction activities shall be conducted with minimal disruption to the Owner's operation. Power outages, bus tie-ins, service change overs and the like shall be scheduled in writing with the Owner.

3.3 Equipment Arrangement and Access

3.3.1 Location of Equipment

Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the drawings may be made to allow for better accessibility at no additional cost to the Owner, but changes shall not be made without review by the Engineer. Minimum clearances in front of or around equipment shall conform to the latest applicable code requirements.

3.3.2 Arrangement of Equipment

The size of equipment shown on the drawings is based on the dimensions of a particular manufacturer. Where other manufacturers are acceptable, it is the responsibility of the Electrical Subcontractor to determine if the equipment he proposed to furnish will fit the space available. Layout drawings shall be prepared by the Subcontractor when required by the Engineer or Owner to indicate a suitable arrangement.



3.4 Equipment Labeling

3.4.1 Panelboards

All panelboards, cabinets and other specified equipment shall be labeled with engraved laminated plastic plates, minimum 3/4" high with 3/8" engraved letters. Punch tapes with mastic backings are not acceptable.

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3.4.2 Starters and Disconnect Switches

All starters, disconnect switches and other specified equipment shall be marked with engraved laminated plastic plates, minimum 1/2" high with 1/4" engraved letters. Where individual switches or circuit breakers in power or distribution panelboards do not have cardholders, they shall be marked with 1/2" high labels.

3.4.3 Empty Conduits

All empty conduits shall have labels tied to the pull string at each end of each empty conduit, marked as to identification of each end. Junction boxes with circuits provided for future use shall be labeled with appropriate circuit designation.

3.4.4 Panelboard Directories

Cardholders for panelboards shall be filled out with typewritten identification of each circuit, except that the word "spare" shall be written in soft pencil to identify all circuit breakers installed that are not used.

END OF SECTION 26 00 00



SECTION 26 05 19

600 VOLT WIRE

Part One: General

1.1 General Requirements

1.1.1 Provisions

The provisions of Section 26 00 00, General Requirements for Electrical Work apply to the work of this section.

1.2 Applicable Codes and Standards

1.2.1 Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ASTM B-3	Soft or Annealed Copper Wire
ASTM B-8	Concentric Lay Stranded Copper Conductors
NEMA WC-5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
NEMA WC-7	Cross-Linked Thermosetting Polyethylene Insulated Wire for the Transmission and Distribution of Electrical Energy
UL 44	Rubber Insulated Wires and Cables
UL 62	Flexible Cord and Fixture Wire
UL 83	Thermoplastic Insulated Wires and Cables

1.3 Submittals Required

1.3.1 Data Sheets

Manufacturer's product data sheets.

1.4 Manufacturers

Subject to compliance with the Specification Requirements:

- Anixter
- General Cable
- Rome Cable
- Approved Equal

Part Two: Products

2.1 General

2.1.1 Conductors

All conductors shall be annealed copper in accordance with ASTM B-3.



2.1.2 Jacket

The jacket of all wire shall be printed with the following information:

- Manufacturer
- Size
- Insulation type
- Maximum voltage
- UL label

2.1.3 Insulation

All insulation shall be rated 600 for volts.

2.2 Power Wiring

2.2.1 Feeders and Motor Branch Circuits

Feeders and motor branch circuits shall be type THHN/THWN.

2.2.2 Description

All power wiring shall be stranded, Class B strand in accordance with ASTM B-8, minimum size #12 AWG.

2.3 Lighting and Receptacle Branch Circuits

2.3.1 Description

All lighting and convenience receptacle branch circuit wiring shall be in type MC cable assemblies, minimum size #12 AWG

2.4 Control Wiring

2.4.1 Description

Wiring for control circuits shall be THHN/THWN stranded, with Class B strand in accordance with ASTM B-8, minimum size #14 AWG.

2.5 Fixture Wire

2.5.1 Description

Where high temperature fixture wire is required it shall be silicone rubber type SF-2.

Part Three: Execution

3.1 General

3.1.1 Installation

All wire shall be installed in accordance with Section 26000, Part 3.1 Wiring Methods.

END OF SECTION 26 05 19



SECTION 26 05 26

GROUNDING EQUIPMENT

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

B. Installation Compliance

The Contractor shall provide a complete grounding system including grounding electrodes, electrode conductors, bonding jumpers, equipment grounding conductors, connections and other materials as may be required for a complete installation. The completed system provided shall meet the requirements of the National Electrical Code and the interpretation of the Local Authority Having Jurisdiction.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NFPA 70	National Electrical Code
UL 467	Grounding and Bonding Equipment

1.3 SUBMITTALS REQUIRED

A. Equipment Data Sheets

Data sheets for chemical grounding systems, exothermal connection methods, and associated wiring.

1.4 MANUFACTURERS

A. Products shall be of firms regularly engaged in manufacture of grounding equipment.

PART TWO: PRODUCTS

2.1 GENERAL

A. Requirements

Provide all equipment, components and parts required to for a complete and operable system.



2.2 GROUND RODS

A. Requirements

Ground rods shall be ¾-inch copper clad steel construction furnished in 10 foot lengths.

2.3 CONDUCTORS

A. Bare Grounding Conductors

Bare grounding conductors shall be soft drawn stranded copper, sized in accordance with NEC Article 250 unless otherwise noted on the Drawings.

B. Insulated Grounding Conductors

Insulated grounding conductors shall be stranded copper with Type TW, THW or THHN/THWN insulation. Grounding conductor shall be provided with green insulation for identification purposes.

2.4 CONNECTIONS

A. Welded Connections

Welded connections shall be exothermic reaction type, as manufactured by Cadweld, or approved equal. The contractor shall provide all molds, crucibles, weld metal, and any necessary materials or equipment required to make connections using this process.

B. Compression Connections

Compression lugs shall be short barrel, one-hole compression type for conductors #2/0 AWG and smaller and long barrel, two-hole compression type for conductors #3/0 AWG and larger.

2.5 GROUNDING BAR

A. Requirements

Provide a wall-mounted copper grounding bar, mounted 6 inches above finished floor. Grounding bar shall be connected directly to the grounding grid.

PART THREE: EXECUTION

3.1 GROUNDING ELECTRODE SYSTEM

A. Requirements

Grounding electrodes of the types shown on the Contract Drawings and as required by NEC shall be provided. Additional electrodes shall be provided if required by the local Authority Having Jurisdiction. All electrodes shall be bonded together to form the grounding electrode system.

B. Installation of Ground Rods

Ground rods shall be driven vertically with the upper end of the rod not less than 2-1/2 feet below finished grade. When conditions require, ground rods may be driven at an angle not to exceed 45 degrees from vertical, with the driven end facing outside of the grounding ring.



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C. Installation of Grounding Ring Conductors

Grounding ring conductors shall be bare copper, sized as shown on the Contract Drawings and installed at a minimum depth of 2-1/2 feet below finished grade. Conductors encased in concrete footings, in or under floor slabs, and in duct banks shall be bare copper, sized as shown on the Contract Drawings. All connections made below grade or encased in concrete shall be exothermic weld type.

D. Connection to Structural Steel

Grounding grid conductors shall be connected to building structural steel as required by the NEC this shall include a connection to reinforcing steel in a minimum of one concrete footing. All connections to building steel shall be exothermic weld type.

E. Grounding Electrode Conductors

The electrical service and all separately derived systems shall be grounded in accordance with NEC Article 250. The grounding electrode conductor shall be copper, sized in accordance with Article 250 of the NEC or as shown on the Drawings.

3.2 EQUIPMENT GROUNDING SYSTEMS

A. Requirements

A separate, insulated copper conductor, with green colored insulation, shall be provided in all raceways and with every feeder, branch and control circuit, in addition to the grounded metallic conduit system. The equipment grounding conductor shall be grounded at both ends.

B. Connection of Equipment Grounding Conductors

Connections to equipment grounding busses shall use compression type termination lugs bolted to a clean, dry surface on the bus, free from any contaminates which may hinder the electrical continuity of the connection. The contractor shall provide any additional hardware and all drilling and tapping that may be required for this connection.

3.3 ADDITIONAL BONDING REQUIREMENTS

A. Grounding of Raceway Systems

All metallic raceways shall be electrically continuous and bonded to the grounding system.

B. Grounding of Cable Tray

Cable tray shall be bonded to the grounding system through the provision of a #2/0 AWG bare copper conductor installed on the exterior rail and supported at 6 foot intervals by a ground clamp. All conduit terminating at the cable tray shall be provided with grounding bushings and bonded to the cable tray grounding conductor.

C. Bonding of Electrical Equipment Busses

All switchgear, switchboard and motor control center grounding busses shall be connected to the grounding electrode system at both ends. Bonding conductor shall be equal to that sized for the feeder to the equipment as shown on the Contract Drawings.



D. Bonding of Other Systems

Interior metal water, gas and sprinkler piping shall be bonded as required by Article 250 of the NEC. The points of attachment of these bonding conductors shall be located in readily accessible locations.

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END OF SECTION 26 05 26



SECTION 26 05 33

RACEWAY AND FITTINGS

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

Provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this Section.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ANSI C80.1	Standard for Rigid Steel Conduit
ANSI C80.3	Standard for Electrical Metallic Tubing
ANSI C80.6	Standard for Intermediate Metal Conduit
UL 1	Flexible Metal Conduit
UL 6	Rigid Metal Conduit
UL 360	Liquid Tight Flexible Steel Conduit
UL 514B	Fittings for Conduit and Outlet Boxes
UL797	Electrical Metallic Tubing
UL870	Wireways, Auxilliary Gutters and Associated Fittings
UL1242	Intermediate Metal Conduit

1.3 SUBMITTALS REQUIRED

A. Manufacturers' product data sheets

1.4 MANUFACTURERS

A. In compliance with the Specification Requirements:

- Allied Tube and Conduit (Conduit)
- Wheatland (Conduit)
- Thomas and Betts (Fittings)
- Appleton (Fittings)
- Crouse Hinds/Cooper (Fittings)
- OZ Gedney (Fittings)
- Killark (Fittings)
- AFC Cable Systems (MC/LFMC)
- Southwire (MC/LFMC)
- Other manufacturers listed in the specification descriptions
- Approved equals



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PART TWO: PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit (GRS)

Rigid steel conduit shall be manufactured from mild steel tube with a uniform protective coating of hot dipped zinc galvanizing inside and outside, including all threads. The conduit shall be furnished in nominal 10-foot lengths, with both ends threaded and furnished with a galvanized coupling on one end and a plastic thread protector on the other end.

B. Rigid Aluminium Conduit

Rigid aluminum conduit, couplings and elbows shall be manufactured of a suitable copper-free aluminum alloy. Conduit lengths shall be seamless throughout and shall have hard, smooth and gum-free interior coatings to facilitate the pulling-in of conductors. It shall be furnished in nominal 10-foot lengths, with both ends threaded and a coupling applied to one end of each length. Threads on the coupling end shall be coated with a special lubricant so that the coupling may be removed without difficulty. Threads on the end opposite the coupling shall be protected from damaged by a plastic cap.

C. Intermediate Metal Conduit (IMC)

Intermediate metal conduit shall be of steel piping with a uniform protective coating of hot dipped zinc galvanizing on the outside of the conduit, including all threads. The conduit shall be furnished in nominal 10-foot lengths, both ends threaded furnished with a galvanized coupling on one end and a plastic thread protector on the other end.

D. Electrical Metallic Tubing (EMT)

Electrical metallic tubing shall be constructed of zinc coated steel with an interior coating of lacquer or enamel to permit easier wire pulling.

E. Liquid Tight Flexible Metal Conduit (LFMC)

Liquid tight flexible conduit shall be constructed with a flexible core of galvanized steel and an oil and sunlight resistant PVC jacket to form a liquid tight raceway. The overall jacket shall be wrinklefree and suitable for use in temperatures from -25°C to +80°C.

F. Flexible Metal Conduit (MC)

Flexible metal conduit shall have an outer armor constructed of be hot dipped galvanized interlocked strip steel.

2.2 CONDUIT FITTINGS

A. Bushings

1. Insulated Bushings

Insulated bushings for conduit sizes 1-1/4 inches and larger shall have metal bodies and threads, with molded-on high impact phenolic thermosetting insulation to prevent conductor insulation damage. Bushings shall be Type "IBC" insulated bushings as manufactured by OZ



Gedney or an approved equal. Insulated bushings for conduit sizes 1 inch and smaller may be of plastic, OZ Gedney Type "A", or an approved equal.

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2. Insulated Grounding Bushings

Insulated grounding bushings shall be similar to the insulated bushings described above, except they shall have set screws to lock the bushings on the conduits and shall have mechanical type lugs attached. The lugs shall be sized to accept the ground wire sizes as set forth in the latest edition of the National Electrical Code, but in no case smaller than No. 8 AWG wire. Grounding bushings shall be Type "BLG" as manufactured by OZ Gedney or an approved equal.

3. Male Bushings

Male bushings shall be Thomas and Betts Corporation insulated throat chase nipples, or a product of equal construction. Bushings used only to pass conductors through metal partitions, etc. shall be OZ Gedney, Type "ABB".

4. Male Bushings

Bushings for use with EMT shall be OZ Gedney type "SBT" or approved equals.

B. Conduit Bodies

Conduit bodies for use with aluminum conduit shall be of copper free aluminum alloy. Those for use with steel conduit may be of galvanized, or cadmium plated cast iron, or of copper free aluminum alloy. All conduit fittings shall be provided with neoprene gaskets and sheet metal covers, except that cast covers shall be used for sized 1-1/2 inches and larger. Rigid conduit connections shall be threaded and EMT connections shall be set screw type. Cover screws shall be captive. All conduit fittings shall be as manufactured by Crouse Hinds, Appleton, Killark or approved equal.

C. Hubs

Water-tight conduit connections are required on all NEMA 3R, 4, and 4X enclosures and all electrical equipment located outdoors or in damp or wet areas. Where hubs or water-tight threaded connections are not provided as part of the enclosure, water-tight hubs shall be Myers "Scrutite", or approved equal. All other terminations shall be double locknut and bushing.

D. Fittings

Fittings for use with liquid-tight flexible conduit shall be zinc plated malleable iron Crouse Hinds type "CGB" or approved equal.

E. Locknuts

Locknuts shall be hot dipped galvanized steel or malleable iron. Standard locknuts shall be used for connections to NEMA 1 enclosures. Sealing locknuts with integral gasket shall be used for connections to NEMA 12 enclosures.



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2.3 JUNCTION BOXES

A. Pull and Junction Boxes

Pull and junction boxes shall be of code gauge metal with continuously welded joints or of cast metal if called for on the Drawings. All junction boxes shall have gasketed screw covers. Boxes for use with aluminum conduits shall be of aluminum. Sheet steel boxes shall be galvanized after fabrications. Screws for galvanized steel box covers shall be made of brass. Screws for aluminum box cover shall be stainless steel.

B. Boxes Installed in Concrete

Boxes installed in concrete shall be cast iron alloy or copper free aluminum.

C. Rating of Boxes

Unless otherwise shown on drawings, all boxes installed indoors shall be rated NEMA 1 and all boxes installed outdoors shall be rated NEMA 3R. Boxes located in fire walls, exterior walls, and at the ceiling of the top floor shall be sealed with UL approved fire sealant material to maintain the rating of the separation as well as providing air sealing to maintain the buildings thermal envelope. Boxes located on opposing sides of rated walls i.e. unit separations, must be at least 24" apart or treated with putty pads per IBC.

2.4 OUTLET BOXES

A. Outlet Boxes for Concealed Work

Outlet boxes for concealed work shall be pressed steel boxes, galvanized and not less than #12 gauge. Each ceiling outlet designated for a lighting fixture shall have a fixture support secured in place with bolts and nuts. Ceiling boxes shall be octagonal with lugs and screws for back plates.

B. Outlet Boxes Installed Outdoors

Outlet boxes installed outdoors, in concrete or exposed, shall be cast iron alloy or copper free aluminum with gasketed covers.

C. Outlet Box Accessories

Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and to fulfill installation requirements for individual wiring situations.

2.5 WIREWAY

A. Wireway

Wireway shall be lay-in type, code gauge steel with dark gray epoxy paint finish inside and out.

B. Covers

Covers shall be hinged with captive screw fasteners for NEMA 1 & NEMA 3R wireway and gasketed quick release latch covers for NEMA 12 wireway.



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2.6 SUPPORTS

A. Sizing

The Electrical Subcontractor shall size and provide all supports necessary for the installation of all raceway.

B. Channel Framing

Channel framing shall be manufactured by Unistrut, Kindort, B-Line or approved equal.

C. Indoor Locations

In dry, non-corrosive areas, channel framing and angle shall be galvanized steel or aluminum and all nuts, bolts and hardware shall be carbon steel, cadmium plated or hot dipped galvanized. Ream clamps shall be galvanized steel or malleable iron.

D. Outdoor, Wet or Damp Locations

In outdoor, wet or damp areas channel framing and angle shall be aluminum or 304 stainless steel and nuts, bolts and hardware shall be 304 stainless steel. Beam clamps shall be hot dipped galvanized steel or malleable iron.

E. Supports

Supports shall be sized with a minimum safety factor of four or 200 lbs. whichever is greater.

PART THREE: EXECUTION

3.1 GENERAL

A. Requirements

See Specification Section 26.05.00 Subsection 3.1 for Wiring Methods.

3.2 INSTALLATION

A. Conduit, EMT, Boxes and Enclosures

Conduit, EMT, boxes & enclosures shall be installed so that they are mechanically secure, electrically continuous and neat in appearance.

B. Exposed Runs

Exposed runs shall be installed to conform to the shape of the surface over which they are run. Where they are run over a plane surface, they shall be straight and true. All exposed conduits shall be run parallel and perpendicular to building column lines and walls. Diagonal runs will not be permitted. Conduit runs in groups shall be supported by means of common members made of channel framing. Group mounting is not required where the group consists of only two conduits. Machine bolts with expansion shields shall be used when fastening to solid masonry or concrete. Toggle bolts shall be used to fasten to hollow masonry.

C. Spacing

Unless otherwise approved, spacing between conduit supports shall not exceed ten feet. Conduits shall not be supported from structural members marked "Removable" on the structural drawings.



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Conduit hangers and supports shall be fastened to buildings and structural members only and not to any equipment or piping. Separate conduits a minimum of 6" from flues, steam and hot water lines. Install conduit above mechanical piping wherever possible.

D. Conduit Supports

All conduit supports other than structural members shall be galvanized. The use of perforated strap or plumber straps will not be permitted.

Conduit up to 1-1/2 inches may be supported by one-hole malleable iron straps with clamp backs.

Conduit 2 inches and larger shall be supported by two-hole straps.

E. Conduit Run Lengths

Conduit runs shall not exceed 100 feet between boxes, fittings or devices.

PVC conduits run above grade shall be sufficiently supported to prevent sagging.

MC cables shall be neatly bundled and tie wrapped and sufficiently supported.

F. Use of Expansion Joints

All conduit crossing building or structure expansion joints shall be provided with approved expansion fittings.

3.3 BENDS

A. Field Bends

Field bends shall be made with approved bending tools. All field-formed bends shall be of maximum radius permitted by the design and construction conditions.

B. Exposed Conduit Changing Direction

Where a group of exposed conduits change direction, the bends shall have a common center in order to maintain the uniformity and neat appearance of the group, having regard for the minimum bending radius of the largest conduit in the group.

C. General

Bends shall be uniform radius and free from cracks, crimps or other damage to the conduit or its coating and shall not unduly flatten the conduit section.

3.4 JOINTS AND TERMINATIONS

A. Joints in Rigid Conduit

All joints in rigid conduit shall be threaded, using standard couplings. The use of running threads, threadless or split couplings is prohibited. When reaming out of conduit ends to remove burrs and rough edges, care shall be exercised to avoid excessive reaming which results in the weakening of the conduit wall at the end.

B. Tightening of Joints

All joints shall be made up wrench tight and with a minimum of wrench work in order to avoid wrench cuts.



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C. Cut Threads

All cut threads shall be thoroughly painted with a coating of a rust inhibiting primer.

D. EMT Couplings and Fittings

EMT couplings and fittings shall be compression type on conduits up to 1-1/4 inch and double set screw type for conduits 1-1/2 inch and larger.

E. Conduit Terminations

All conduit terminations in panels, enclosures, outlet boxes and equipment shall be provided with bushings.

3.5 FLEXIBLE CONDUIT

A. Terminations

Flexible conduit shall be use to terminate all, lighting, motors, unit lanterns, transformers, pilot devices and vibrating equipment.

B. Liquitite Flexible Conduit

Liquitite flexible conduit and fitting shall be used outdoors and in all damp or wet areas, or where exposed to grease or oil.

C. Connections to Lighting Fixtures

Connections to lighting fixtures (lighting whips) shall be maximum length of 6 feet. All other flexible connections shall be maximum 24 inches.

3.6 PENETRATIONS

A. Penetrations through Slabs, Walls, Roofs

All penetrations through concrete slabs, masonry walls or roofs shall be provided with sleeves.

B. Sleeves

All sleeves shall be sealed to maintain the integrity of the structure. Fire resistant walls and floors shall be sealed with approved material, and shall maintain the original fire rating. All seals below grade shall be watertight, O.Z./Gedney type WSK or approved equal.

END OF SECTION 26 05 33

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SECTION 26 24 16

PANELBOARDS

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA 250	Enclosures for Electrical Equipment
NEMA AB-1	Molded Case Circuit Breakers
NEMA KS-1	Enclosed Switches
NEMA PB-1	Panelboards
UL 50	Enclosures for Electrical Equipment
UL 67	Panelboards
UL 98	Enclosed and Deadfront Switches
UL 489	Molded Case Circuit Breakers and Circuit Breaker Enclosures
UL 943	Ground Fault Circuit Interrupters

1.3 SUBMITTALS REQUIRED

A. Manufacturer's product data sheets.

B. Circuit breaker schedules.

1.4 MANUFACTURERS

A. Subject to compliance with the specification requirements:

- Square D
- Cutler Hammer
- General Electric



PART TWO: PRODUCTS

2.1 GENERAL

A. Panelboards

Panelboards, including lighting and appliance panelboards and power distribution panelboards, shall be of the sizes, rating and arrangement shown on the drawings.

B. Overcurrent Devices

Panelboards shall be provided complete with all overcurrent devices, accessories and trim.

C. Safety Barriers

All panelboards shall be provided with safety barriers for dead front construction.

D. Short Circuit Ratings

The required short circuit ratings of assembled panelboards are shown on the Drawings. The short circuit rating of every overcurrent device in the panel shall meet or exceed the panel rating. Unless otherwise noted on the Drawings, series rated combinations will not be permitted.

2.2 CABINETS

A. Boxes

Boxes shall be code gauge galvanized sheet steel.

B. Trim

Trim shall be code gauge steel, ANSI-61 gray finish with stainless steel flush type lock/latch handle. All locks shall be keyed alike.

C. Surface Mounted Panels

Trim for surface mounted panels shall be door-in-door construction such that the gutter space may be exposed by a hinged door.

D. Frames

Directory frames shall be metal frame with plastic covers.

2.3 BUS

A. Bus Work

All bus work shall be 750 amp/sq.in. aluminum.

B. Neutral Buses

Unless otherwise noted on the drawings, neutral busses shall be 100% rated with adequate connections for all outgoing neutral conductors.



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C. Panelboards

Panelboards shall be provided with aluminum ground busses.

D. Connection

Bus shall be designed for sequence phase connection to allow the installation of one, two or three pole branch circuit breakers in any position.

2.4 OVERCURRENT DEVICES

A. Device Type

Overcurrent devices shall be trip-free molded case, bolt-on, thermal magnetic circuit breakers.

B. Main Circuit Breakers

Main circuit breakers shall be individually mounted and bolted to bus assembly. Back-fed branch mounted circuit breakers are prohibited.

C. Circuit Breakers Frontfaces

Front faces of all circuit breakers shall be flush. Trip indication shall be clearly shown by the handle position between the ON and OFF positions.

D. Ground Fault Circuit Breakers

Ground fault circuit breakers shall be provided as required on the Contract Drawings and shall require no more panel space than standard breakers.

E. Switching Lighting Circuit Breakers

Where circuit breakers are used for switching of lighting, circuits type "SWD" circuit breakers shall be provided.

F. Connections

All connections shall be rated for 75°C copper conductors.

PART THREE: EXECUTION

3.1 GENERAL

A. Installation

Panelboards shall be installed in accordance with Manufacturer's Instructions. Panelboard mounting heights shall be mounted so the highest breaker switch device does not exceed 48" of the finished floor.

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SECTION 26 28 16

SAFETY SWITCHES

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA KS-1	Enclosed Switches
UL 98	Enclosed and Deadfront Switches

1.3 SUBMITTALS REQUIRED

A. Manufacturer's product data sheets.

1.4 MANUFACTURERS

A. Subject to compliance with the specification requirements:

- General Electric
- Square D
- Siemens
- Cutler Hammer

PART TWO: PRODUCTS

2.1 GENERAL

A. Description

Safety switches shall be 240 VAC, NEMA heavy duty, horsepower rated visible blade type. Switches shall be non-fused or fused as indicated on the drawings. Lugs shall be front removable and UL listed for copper conductors. All current carrying parts shall be plated to resist corrosion.

B. Switch Operating Mechanism

The switch operating mechanism shall be spring activated quick make - quick break, such that during the normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening operation of the contacts has been started.



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C. External Operating Handle

The external operating handle shall be an integral part of the box and not the cover. The operating handle shall also indicate the switch position, ON in the up position, OFF in the down position and be capable of being padlocked in the OFF position. An interlock shall be provided to prevent opening the cover when the switch is ON and prevent closing the switch contacts when the cover is opened. This interlock mechanism shall be provided with an externally operated override.

D. Arc Suppressors and Line Terminal Shields

Switches shall be provided with arc suppressors and line terminal shields. Arc suppressors shall be removable if necessary to facilitate access to line side lugs.

E. Number of Switched Poles

Single speed motors shall be provided with three pole switches. Two speed motors shall be provided with six pole switches.

F. Ground Kit

Switches shall be provided with a factory supplied ground kit.

G. Fused Switches

Fused switches shall be provided with class H or K fuses.

H. Short Circuit Rating

The UL Listed short circuit current rating of the switches shall be 10KAIC when used with Class H or K fuses.

I. Enclosures

Safety switches installed indoors shall be provided with NEMA 1 enclosures. Safety switches installed outdoors or in wet areas shall be provided with NEMA 3R enclosures.

PART THREE: EXECUTION

3.1 GENERAL

A. Installation

Safety Switches shall be installed in accordance with Manufacturer's Instructions.

END OF SECTION 26 28 16



SECTION 26 29 13

MOTOR CONTROLLERS

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 00 00, General Requirements for Electrical Work apply to the work of this section.

B. The work of this section includes locally installed, enclosed combination magnetic motor starters and manual motor starters.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA ICS-2	Industrial Control Devices, Controllers and Assemblies.
NEMA ICS-6	Enclosures for Industrial Controls and Systems
UL 508	Industrial Control Equipment.

1.3 SUBMITTALS REQUIRED

A. Manufacturer's product data sheets.

B. Dimensioned Outline Drawings.

C. Control wiring diagrams.

1.4 MANUFACTURERS

A. Subject to compliance with the specification requirements:

- Square D
- Cutler Hammer
- General Electric
- Siemens

PART TWO: PRODUCTS

2.1 MANUAL MOTOR STARTERS

A. Single Phase Fractional HP Manual Motor Starters



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Single phase fractional HP manual motor starters shall be toggle operated, enclosed, one or two pole switches as required by the installation.

B. Enclosure

The enclosure shall be NEMA 1 for indoor locations and NEMA 3R for outdoor, wet and damp locations. A handle guard shall be provided to allow the toggle operator to be padlocked in the OFF position.

C. Overloads

Starters shall be provided with trip free melting alloy thermal overloads.

PART THREE: EXECUTION

3.1 GENERAL

A. Installation: Equipment shall be installed in accordance with manufacturer's instructions.

B. Overload Heater Elements

The Contractor shall verify motor nameplate amperes and motor service factors and shall provide all overload heater elements and fuses. Overload heater elements shall be sized in accordance with motor nameplate characteristics.

C. Auxiliary Contacts

The Contractor shall verify and provide the proper number of auxiliary contacts required by equipment provided by others, for control and interlocking of equipment specified in other Divisions of this Specification. Coordinate these requirements with Division 15 Controls Contractor.

END OF SECTION 26 29 13



SECTION 26 31 15

LIGHTING FIXTURES

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work, and section 26 05 33, Raceway and Fittings, apply to the work of this section.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

CBM Labels	Certified Ballast Manufacturers Assoc.
NEC Art. 410	National Electrical Code
FCC, Part 18	RFI and EMI
ANSI C62.41	Line Transient Protection
UL 924	Emergency Lighting and Power Equipment
UL 1088	Temporary Lighting

1.3 SUBMITTALS REQUIRED

A. Data Sheets, Photometrics and Installation Instructions

Submit manufacturer's product data, photometrics, and installation instructions for each type of light fixture specified. Fixture submittals will be in booklet form with separate sheet for each fixture assembled in "luminaire type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

1.4 MANUFACTURERS

A. General

The fixture types, manufacturers and model numbers are shown on the lighting schedule in the Contract Drawings. These fixtures and manufacturers are listed to establish a baseline type, style and quality of fixture to be provided. Although one manufacturer may be listed on this lighting schedule, other manufacturers' representatives may submit fixtures for consideration as "equal" fixtures to facilitate the "packaging" of the lighting fixtures within the representative's product lines. The architect and engineer however reserve the right to require certain individual fixtures be provided of the model and manufacturer specified in order to meet specific design intent by the architect or engineer.

B. Exterior Fixtures

The Architect and Engineer reserve the right to require that the specified model and manufacturer of some or all of the exterior lighting fixtures be furnished by this contractor, due to approvals of



local authorities required prior to Issue of Project Documents. No additional compensation will be furnished to the contractor for “assumptions” that alternate fixtures could be substituted for those specified.

PART TWO: PRODUCTS

2.1 GENERAL

A. Efficiency Maine

The Electrical Contractor shall be responsible for all submissions to Efficiency Maine for the purpose of securing any potential lighting rebates for the Owner. All lighting fixtures shall meet the current Efficiency Maine requirements for rebate and be listed by Design Light Consortium (DLC) or Energy Star for that purpose.

B. Light Fixtures

Light fixtures shall be provided with housings, trims, ballasts, lamp holders, sockets, reflectors, wiring and other components required, as a factory-assembled unit for a complete installation.

C. Electrical Wiring

Provide electrical wiring within light fixtures suitable for connecting to branch circuit wiring in accordance with N.E.C. Article 410, Paragraph 25.

D. Packaging

Deliver interior lighting fixtures shall be delivered in factory fabricated containers and wrapping, in order to properly protect fixtures from damage.

E. Storage

Interior lighting fixtures shall be stored in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, humidity, extreme temperatures, laid flat and on skids to keep off floors and ground.

F. Ceiling Fixtures

Fixtures installed in ceilings, suspended from ceilings or on walls shall be installed with a plastic film covering protecting the lens, louver and lamps from dust, dirt and debris during construction. Plastic film shall be removed upon the completion of construction.

2.2 LED FIXTURES

A. General

Provide LED fixtures of sizes, types and ratings indicated and specified in the Lighting Fixture Schedule on the Contract Drawings. All assembly combinations shall be listed by DLC or Energy Star, and approvable by Efficiency Maine for rebate purposes.

2.3 LAMPS

A. Lamp Requirements



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Provide LED lamps of types as indicated on the contract drawings.

2.4 OCCUPANCY SENSORS

A. General

Occupancy sensors of the type and model specified on the drawings shall be provided, installed and wired into the local lighting circuit in the area that the sensors are installed. The engineer will consider equipment of another equal manufacturer, where suitable coverage can be documented.

B. Passive Infrared Wall-Mount Fixtures

Wall mounted occupancy sensors shall be suitable for dual circuit operation as specified on the contract drawings.

C. Ultrasonic/Infrared Ceiling-Mounted Sensors

Ceiling mounted occupancy sensors shall be self-calibrating type as specified on the contract drawings.

D. Power Packs

Power packs shall be provided as required for each room provided with occupancy sensors as needed.

E. Slave Relay Packs

Slave relay packs shall be provided in rooms with more than one lighting circuit controlled by the occupancy sensor.

F. Installation Requirements

Provide all miscellaneous equipment and wiring for a complete installation.

2.6 LIGHTING CONTROLS

A. General

Operation of exterior lighting is to be provided with a combination of photocell (ON), time clock (ON or OFF), and automatic control override switch (ON) through a UL listed lighting contactor. These controls shall be provided with all components required for a fully-operable system.

B. Lighting Contactors

Lighting contactors shall be provided in a NEMA 1 enclosure sufficiently sized to also house the time clock. Lighting contactors shall be listed for operation with the voltages shown on the Contract Drawings. Lighting contactors shall be multi-pole type sized sufficiently for the number of circuits shown on the contract drawings and a minimum of one spare circuit. Contactors shall be mechanically held with Normally Open (N.O.) contacts which are convertible to Normally Closed (N.C.) type.



C. Photocells

Photocells shall be provided as shown on the Contract Drawings. Mounting location and height shall be as shown on the Drawings and further coordinated with the architect and engineer prior to installation for exact location of box. Photocell shall be provided with NEMA 4 enclosure to be mounted on standard 2"x4" exterior junction box.

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PART THREE: EXECUTION

3.1 GENERAL

A. Prior Examination

Examine all areas and conditions under which lighting fixtures are to be installed and structure which will support lighting fixtures. Notify the Contractor in writing of any conditions detrimental to proper installation and completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Coordinate Installation

Coordinate light fixture installations with other trades. Fluorescent light fixtures should be installed at least two feet away from smoke detectors. Coordinate all lighting fixtures with mechanical piping and ductwork to allow for proper clearance.

3.2 INSTALLATION

A. Locations and Heights

Install all lighting fixtures at locations and heights indicated, in accordance with the architectural reflected ceiling plans.

B. Recessed Lighting Fixtures

All recessed lighting fixtures installed in ceiling which require a fire resistance rating shall be installed in accordance with the 1996 BOCA National Building Code Section 713.

C. Fastening and Supporting Fixtures

Provide fixtures and/or fixture outlet boxes with hangers, channel or other method of fastening and supporting fixtures required for proper installation.

D. Pendant Mounted Fixtures

All pendant mounted fixtures shall be installed plumb and level or as detailed on the Contract Drawings. Pendant mounted fixtures longer than 18" shall have twin hangers of type specified.

E. Tightening Values

Tighten connectors and terminals, including screws and bolts in accordance with equipment manufacturer's published torque tightening values for equipment connectors. All screws and bolts shall have washers.



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3.3 SPLICES AND TERMINATIONS

A. General

Twist on wire connectors shall be installed which utilize square-wire spring grips and thermo plastic shells. Install connectors to meet the manufacturer's torquing requirements. Install wire connectors of size required as not to exceed the manufacturers UL-listed CSA recognized wire combinations

3.4 FIELD QUALITY CONTROL

A. Replacement of Lamps

At date of substantial completion, all lamps that are not functioning, have color deficiencies, or are noticeably dimmed shall be replaced with new lamps as determined by the Engineer.

B. Cleaning Light Fixtures

All light fixtures shall be cleaned of dirt and debris upon completion of construction. All finger prints and smudges shall be cleaned.

C. Protection During Construction

All installed fixtures during remainder of construction shall be protected in accordance with section 2.1.5 of this specification section.

D. Grounded

All light fixtures shall be grounded in accordance with article 250 and 410 of the NEC. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

E. Damaged Light Fixtures

All light fixtures damaged in shipping or during installation shall be replaced with new fixtures at no cost to the owner.

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SECTION 26 51 00

TELEPHONE AND DATA SYSTEMS

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section. The intent of this document is to provide a standard specification that will be used for providing voice and data drops within the new addition to the building, including wiring, conduits and devices. Contractor shall punch down all cable at jacks and patch panels.

B. Project Conditions

Existing Telephone and Data Room located in the main office of the existing building shall be reused as part of this scope.

Run all data wiring back to new IDF Area, in office 103. The existing services shall be reconnected or new services shall be furnished by the Telephone/CATV utilities.

Jack locations, number of data connections to each jack locations are shown on the Contract Drawings.

PART TWO: PRODUCTS

2.1 CONDUITS

See Section 26 05 33, Electrical Raceways for conduit and raceway requirements.

2.2 CABLING

A. Data Cabling: Shall be Category 6.

B. Fiber Optic Cable: Shall be armored, 6-fiber multimode type.

2.3 DEVICES

A. PATCH PANEL: Furnish a 48-Port, 2U Rack mount CAT 6, 110 Patch Panel, with 568B Port, RJ-45 Ethernet. As manufactured by Tripp-Lite, Model N252-048. This shall be mounted in the IT room and all Cat6 cables shall be punched down onto this panel.

B. JACKS: Each outlet shall contain the designated number of Category 6 jacks. The outlet plates, unless otherwise noted, shall be mounted to single gang boxes, box eliminators, surface mount boxes, and/or floor monuments as required.



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PART THREE: EXECUTION

3.1 GENERAL

- A. See Section 26 05 00, General Requirements for Electrical Work for wiring installation requirements.
- B. Install plenum cable exclusively on this project, except that cables installed in or under slab shall be rated for wet environments.
- C. When not in conduit or cable tray install in J-Hooks designed explicitly for communications cabling. Bridle rings, cable ties, mechanical, and structural steel are not acceptable means of supporting communications cables.
- D. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- E. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- F. Comply with TIA/EIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- G. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- H. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.2 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-C.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. MUTOA shall not be used as a cross-connect point.
 - 5. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 6. Cables may not be spliced. Secure and support cables at intervals not exceeding 48 inches (1220 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 7. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.



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9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot- (3-m-) long service loop, at the remote termination install a 3-foot (1-m) long service loop.
12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-C.2.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 48 inches (1220 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

1. All VOICE cables shall terminate in Patch panels designated for VOICE.
2. All DATA cables shall terminate on Patch panels designated for DATA.

3.3 IDENTIFICATION

A. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.



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3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

3. Visually inspect UTP jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.1.
4. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
5. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
6. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
7. UTP Performance Tests:
 - a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-C.1 and TIA/EIA-568-C.2:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.
8. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
 - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface



device at the demarcation point. Log onto the network to ensure proper connection to the network.

- C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

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