

Arroyo HS - Interim Housing

PROJECT MANUAL

Date: 05.29.2026
Project Number: 3361-008-101
Phase: DSA Submittal
Agency Number: DSA Appl #03-126126 / File 19-H10



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ARCHITECT



VCA Engineering
CIVIL ENGINEER



Budlong
ELECTRICAL ENGINEER

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PROVIDED BY OWNER UNDER SEPARATE COVER.

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Contractor's use of site and premises.
 2. Coordination with occupants.
 3. Work restrictions.
 4. Specification and Drawing conventions.

1.02 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways, and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

1.03 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1.04 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.

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1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
 - B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
 - C. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations.
- 1.05 SPECIFICATION AND DRAWING CONVENTIONS
- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
 - B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
 - C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

1.02 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.03 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.

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- h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.04 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.05 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.06 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied,

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Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- b. Substitution request is fully documented and properly submitted.
- c. Requested substitution will not adversely affect Contractor's construction schedule.
- d. Requested substitution has received necessary approvals of authorities having jurisdiction.
- e. Requested substitution is compatible with other portions of the Work.
- f. Requested substitution has been coordinated with other portions of the Work.
- g. Requested substitution provides specified warranty.
- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.

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- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

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PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.02 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.03 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

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CONTRACT MODIFICATION PROCEDURES
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1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.04 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor..

1.05 CONSTRUCTION CHANGE DIRECTIVE

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 26 73 – DSA CONSTRUCTION CHANGE DOCUMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing DSA Construction Change Documents for modifications of portions of the project affecting the Structural Safety, Access Compliance, and Fire and Life Safety.
- B. Related Sections:
 - 1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling contract modifications not affecting the Structural Safety, Access Compliance, and Fire and Life Safety portions of the project.

1.02 DEFINITIONS

- A. DSA: Division of the State Architect.

1.03 CONSTRUCTION CHANGE DOCUMENT

- A. Construction Change Document: Architect will submit a Construction Change Document on DSA Form 140 Application for Approval of Construction Change Document to DSA. Upon DSA approval of a Construction Change Document, Architect will notify Contractor to proceed with the change in the Work, for subsequent inclusion in a Change Order.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.02 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Arrange schedule of values consistent with format of AIA Document G703.
 - 2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - 3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
 - 4. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 - 5. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.03 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

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- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use form designated by Architect as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien in accordance with Owner's requirements and as follows:
 - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit conditional final or full waivers.
 - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 - 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Contractor's construction schedule (preliminary if not final).
 - 4. Products list (preliminary if not final).
 - 5. Sustainable design action plans, including preliminary project materials cost data.
 - 6. Schedule of unit prices.
 - 7. Submittal schedule (preliminary if not final).

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8. List of Contractor's staff assignments.
 9. List of Contractor's principal consultants.
 10. Copies of building permits.
 11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 12. Initial progress report.
 13. Report of preconstruction conference.
 14. Certificates of insurance and insurance policies.
 15. Performance and payment bonds.
 16. Data needed to acquire Owner's insurance.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706.
 5. AIA Document G706A.
 6. AIA Document G707.
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Project meetings.

1.02 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. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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.

1.03 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates

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coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

1.04 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 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 information or interpretation and the following:
 1. Owner name.
 2. Owner's Project number.
 3. Name of Architect.
 4. Architect's Project number.
 5. Date.
 6. Name of Contractor.
 7. RFI number, numbered sequentially.
 8. RFI subject.
 9. Specification Section number and title and related paragraphs, as appropriate.
 10. Drawing number and detail references, as appropriate.
 11. Field dimensions and conditions, as appropriate.
 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 13. Contractor's signature.
 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

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- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
 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 Section 01 26 00 "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 five days of receipt of the RFI response.
- E. 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 three days if Contractor disagrees with response.

1.05 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
- B. Preconstruction Conference: Architect will schedule and conduct 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.
1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. 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. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Critical work sequencing and long lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.

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- 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. Sustainable design requirements.
 - l. Preparation of Record Documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Sustainable Design Requirements Coordination Meetings: Schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner Architect, and Contractor. Schedule progress meetings at quarterly intervals during construction.
- 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. 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 meeting sustainable design requirements, including the following:
 - a. Sustainable design Project checklist.
 - b. General requirements for sustainable design-related procurement and documentation.
 - c. Project closeout requirements and sustainable design certification procedures.
 - d. Construction waste management.
 - e. Construction operations and sustainable design requirements and restrictions.

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3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for 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.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.
 3. 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 other parties requiring information.
 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.
- E. Progress Meetings: Conduct progress meetings at regular intervals.
 1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. 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) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Status of sustainable design documentation.

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- 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.
 - 9) Site use.
 - 10) Temporary facilities and controls.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Status of RFIs.
 - 16) Status of Proposal Requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- 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.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.

1.02 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- C. Construction Schedule Updating Reports: Submit with Applications for Payment.

1.03 COORDINATION

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

1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial 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 floor or separate area as a separate numbered activity for each main 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. Temporary Facilities: Indicate start and completion dates for the following as applicable:

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- a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.
 - d. Owner interfaces and furnishing of items.
 - e. Interfaces with Separate Contracts.
 - f. Regulatory agency approvals.
 - g. Punch list.
3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 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 completion of punch list items and Final Completion.
- C. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- D. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 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 Final Completion percentage for each activity.
- E. 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.
- 1.05 GANTT-CHART SCHEDULE REQUIREMENTS
- 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.

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1. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.

1.02 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."

1.03 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list 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.

1.04 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Architect.
 - 4. Name of Contractor.
 - 5. Name of firm or entity that prepared submittal.
 - 6. Names of subcontractor, manufacturer, and supplier.
 - 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 - 8. Category and type of submittal.
 - 9. Submittal purpose and description.

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10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.05 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

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.

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. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

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1.06 SUBMITTAL REQUIREMENTS

- A. 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 unsuitable 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.
 - 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 that show 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 Shop Drawings, and before or concurrent with Samples.
- B. 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.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

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2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. 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.
 4. 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 full set(s) 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.
 5. 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 one Sample set; remainder will be returned. 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.
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and

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addresses, contact information of architects and owners, and other information specified.

- E. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- F. Certificates:
1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
 2. 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.
 3. 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.
 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 6. 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.
- G. Test and Research Reports:
1. 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 substrate preparation and primers required.
 2. 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.
 3. 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.
 4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of

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tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

5. 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.
6. 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:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.07 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 insufficient 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 digitally signed PDF file, 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.

1.08 CONTRACTOR'S REVIEW

- A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.

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1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.09 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
- 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. Architect will return without review or discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned or discarded by Architect without action.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Related Sections:
 - 1. Section 01 43 39.16 "Integrated Exterior Mockups" for integrated exterior mockup assembly requirements.
- C. Testing and inspection 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. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.02 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. 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, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination,

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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.

1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall have the same meaning as testing agency.
- I. 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.
- J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.03 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.

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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 Statement: Submit a statement, 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.04 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification 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.

1.05 ACTION SUBMITTALS

- A. Mockup Shop Drawings: For laboratory mockups.
 1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
 2. Indicate manufacturer and model number of individual components.
 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.06 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

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- B. 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.
- C. Permits, Licenses, and Certificates: For Owner's record, 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.

1.07 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, telephone number, and email address 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 inspection.
 - 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. Statement on condition of substrates and their acceptability for installation of product.
 - 2. Statement that products at Project site comply with requirements.
 - 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 5. 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:

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1. Statement that equipment complies with requirements.
2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
3. Other required items indicated in individual Specification Sections.

1.08 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. 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.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, 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.
- 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 in material, design, and extent to those indicated for this Project.
- F. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- G. 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.
- H. 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:

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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. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - d. When testing is complete, remove test specimens and test assemblies, and 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.
- I. 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 of size indicated.
 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 10. Demolish and remove mockups when directed unless otherwise indicated.
- 1.09 QUALITY CONTROL
- A. Owner Responsibilities: Where quality-control services are indicated 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 inspection they are engaged to perform.

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2. 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, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. 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.
- D. Contractor-Engaged 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 locations 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 duties of Contractor.
- E. 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 Section 01 33 00 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical

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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.

- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives 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 inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, 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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams

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that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching.

- 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.

END OF SECTION

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SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.01 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.02 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

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- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.03 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 43 39.16 - INTEGRATED EXTERIOR MOCKUPS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Related Sections:
 - 1. Division 01 Section "Quality Requirements" for mockups not addressed in this section and additional requirements that apply to this section.

1.02 DEFINITIONS

- A. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.
 - 1. Include each system, assembly, component, and part of the exterior wall to be constructed for the Project. Colors of components shall be those selected by the Architect

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, testing and inspecting agency representative, and installers of major systems whose Work is included in integrated exterior mockups.
 - 2. Review locations and extent of mockups.
 - 3. Review and finalize schedule for mockups, and verify availability of materials, personnel, equipment, and facilities needed to complete mockups and maintain schedule for the Work.

1.04 ACTION SUBMITTALS

- A. Delegated Design Submittal: For temporary structural supports for mockups not attached to building structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 QUALITY ASSURANCE

- A. Build mockups to do the following:
 - 1. Verify selections made under Sample submittals.
 - 2. Demonstrate aesthetic effects.

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3. Demonstrate the qualities of products and workmanship.
 4. Demonstrate acceptable coordination between components and systems.
- B. Fabrication: Before fabricating or installing portions of the Work requiring mockups, build mockups for each form of construction and finish required. Use materials and installation methods as required for the Work.
1. Build mockups of size indicated.
 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed unless otherwise indicated.
- C. Notifications:
1. Notify Architect seven days in advance of the dates and times when mockups will be constructed.
 2. Allow seven days for initial review and each re-review of each mockup.
- D. Approval: Obtain Architect's approval of mockups before starting fabrication or construction of corresponding Work.
1. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 COORDINATION

- A. Coordinate schedule for construction of mockups, so construction and review of mockups do not impact Project schedule.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design support structure for free-standing mockups.
- B. Structural Performance:

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1. Seismic Performance: Mockups and support structure to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
2. Wind Loads: As indicated on Drawings.

2.02 INTEGRATED EXTERIOR MOCKUPS

- A. Construct integrated exterior mockups as indicated on Drawings. Construct mockups to demonstrate constructability, coordination of trades, and sequencing of Work; and to ensure materials, components, subassemblies, assemblies, and interfaces integrate into a system complying with indicated performance and aesthetic requirements.
- B. Design and construct foundation and superstructure to support free-standing integrated exterior mockups.
- C. Build integrated exterior mockups using installers and construction methods that will be used in completed construction.
- D. Use specified products that have been approved by Architect. Coordinate installation of materials and products specified in individual Specification Sections that include Work included in integrated exterior mockups.
- E. Provide and document modifications to construction details and interfaces between components and systems required to properly sequence the Work, or to pass performance testing requirements. Obtain Architect's approval for modifications.
- F. Retain approved mockups constructed in place. Incorporate fully into the Work.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.02 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

1.03 INFORMATIONAL SUBMITTALS

- A. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- D. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.

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3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

- E. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
1. Methods used to meet the goals and requirements of the Owner.
 2. Concrete cutting method(s) to be used.
 3. Location of construction devices on the site.
 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.

1.04 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and the California Building Code.

1.05 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

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PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- C. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- D. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.03 SUPPORT FACILITIES INSTALLATION

- A. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.

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- B. Parking: Provide temporary offsite or use designated areas of Owner's existing parking areas, if authorized, for construction personnel.
- C. Storage and Staging: Provide temporary offsite area or use designated areas of Project site for storage and staging needs.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

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3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- I. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 2. Insulate partitions to control noise transmission to occupied areas.
 3. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 4. Protect air-handling equipment.
 5. Provide walk-off mats at each entrance through temporary partition.
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.

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3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.05 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard and replace stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction

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and remain wet for 48 hours are considered defective and require replacing.

- b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
- c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.06 OPERATION, TERMINATION, AND REMOVAL

- A. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

END OF SECTION

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SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling and comparable products.

1.02 DEFINITIONS

- A. Products: Items obtained 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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product

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procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 33 00 "Submittal Procedures."
- F. Substitution: Refer to Section 01 25 00 "Substitution Procedures" for definition and limitations on substitutions.

1.03 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

1.05 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: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

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- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, 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 meeting requirements of the Contract Documents.
 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: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

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- a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
 4. Non-Limited List of Products: 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.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
 5. Limited List of Manufacturers: 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.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
 6. Non-Limited List of Manufacturers: 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.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
 7. 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 may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches

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Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a 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.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.
1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.02 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 33 00 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 01 33 00 "Submittal Procedures."
 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

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- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Installation of the Work.
 - 2. Progress cleaning.
 - 3. Starting and adjusting.
 - 4. Protection of installed construction.

PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 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, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

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2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to Owner 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.

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- C. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

3.04 INSTALLATION

- A. 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.

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4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- 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 satisfactory results as judged by Architect. 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 of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 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.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.

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3.05 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three 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.
 - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.06 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- 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: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.07 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

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SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Cutting and patching.

1.02 DEFINITIONS

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

1.03 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
 - e. HVAC shutdown and sealing of air intakes.
 - 2. Coordinate work activities with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
 - 3. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.04 INFORMATIONAL SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

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1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.05 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements 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 specified products and equipment.

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PART 2 - PRODUCTS

2.01 MATERIALS

- A. Comply with requirements specified in other Sections.
- 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 Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

PART 3 - EXECUTION

3.01 CUTTING AND PATCHING

- 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 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. 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.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. 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.
- E. 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 in Section 01 10 00 "Summary."
- F. 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 prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage

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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 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.

H. 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, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

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 eliminate 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, corner to corner of wall and edge to edge of ceiling. 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. Roofing Membrane Assemblies: Patch roofing membrane penetrations and transitions with reinforced, liquid applied PMMA flashing membrane. Embed roofing granules to match existing roofing granule cap and flashing sheets.

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6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

END OF SECTION

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.

1.02 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.03 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.04 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, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

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4. Submit maintenance material submittals specified in individual 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.
 5. Submit testing, adjusting, and balancing records.
 6. Submit sustainable design submittals not previously submitted.
 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.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 6. Advise Owner of changeover in utility services.
 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.
 10. Touch up paint 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.
- 1.05 FINAL COMPLETION PROCEDURES
- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with 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),

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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.

- 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.

1.06 LIST OF INCOMPLETE ITEMS

- 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, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. PDF Electronic File: Architect will return annotated file.

1.07 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

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PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. Perform 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 designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. 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.
 - c. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - d. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - e. Vacuum and mop concrete.
 - f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - h. Remove labels that are not permanent.
 - i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

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- j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- l. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- m. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- n. Clean strainers.
- o. Leave Project clean and ready for occupancy.

END OF SECTION

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Systems and equipment operation manuals.
 - 2. Systems and equipment maintenance manuals.
 - 3. Product maintenance manuals.

1.02 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
- C. 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.

1.03 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks

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reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.04 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. 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. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has 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.
- C. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 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.
- D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.

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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.

- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.05 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. 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 warranties and bonds as described below.
- C. 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 and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; 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.

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- a. 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.
 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.
- E. 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 video recording, if available.
- F. 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.
- G. 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.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. 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.
- J. 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 maintenance manuals.

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1.06 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. 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.
- C. 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 and drawing or schedule designation or identifier where applicable.
- D. 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.
- E. 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.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. 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 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 78 36 - WARRANTIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for warranties on products and systems.
- B. Related Sections:
 - 1. Section 01 77 00 "Closeout Procedures" for submitting warranties.

1.02 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, system, and installation warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product or system and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner for a particular product or system and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - a. Installation Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner for a particular product or system and issued in the name of the Owner or endorsed by installer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.

1.02 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.

1.03 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 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 provide information for preparation of corresponding 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 acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 - 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.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.

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- 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 and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record prints 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 into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file.
 - 3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

1.04 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. Note related Change Orders and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file .

1.05 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents 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

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in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 81 13.71 - SUSTAINABLE DESIGN REQUIREMENTS - CALGREEN NON-RESIDENTIAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: General requirements and procedures for compliance with 24 CCR 11, California Green Building Standards Code (CALGreen).
 - 1. Some CALGreen requirements depend on product selections and may not be specifically identified as CALGreen requirements. Compliance with CALGreen requirements may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 2. Some CALGreen requirements depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
 - 3. Additional CALGreen requirements not included in this specification apply to the Project.

1.02 DEFINITIONS

- A. CALGreen: California Green Building Standards Code, including supplements in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. Definitions that are part of CALGreen apply to this Section.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Architect about CALGreen requirements that depend on product selection or product qualities. Document responses as informational submittals.
- B. When requested by enforcing agency submit substantiating documentation confirming compliance with CALGreen requirements.
- C. Sustainable design submittals shall be identified and submitted separately from other submittals.

1.04 INFORMATIONAL SUBMITTALS

- A. Sustainable Design Submittals:
 - 1. Documentation for Construction and Demolition Waste Management: Submit documentation complying with CALGreen for one of the following:
 - a. Construction Waste Management Plan.
 - b. Waste Management Company.

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c. Waste Stream Reduction Alternative.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Construction and Demolition Waste Management: Achieve end-of-Project rates for salvage/recycling of not less than 65 percent of total nonhazardous solid waste generated by the Work. Comply with local construction and demolition waste management ordinance when it is more stringent.
- B. Universal Waste: Universal Waste items such as fluorescent lamps and ballast, and mercury containing thermostats, as well as other California prohibited Universal Waste materials shall be disposed of properly and diverted from landfills.
- C. Site-Clearing Waste: 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled. If contamination by disease or pest infestation is suspected, contact the Country Agricultural Commissioner and follow its direction for recycling or disposal of the material.

2.02 MATERIALS

- A. Provide products and procedures necessary to comply with CALGreen requirements in this Section. Although other Sections may specify some requirements that contribute to referenced CALGreen requirements, determine additional materials and procedures necessary to comply with CALGreen requirements indicated.

2.03 LOW-EMITTING MATERIALS

- A. Adhesives and Sealants:
 - 1. For field applications, adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, and caulks shall comply with VOC content limits of authorities having jurisdiction, or the following VOC content limits:
 - a. Indoor Carpet Adhesives: 50 g/L.
 - b. Carpet Pad Adhesives: 50 g/L.
 - c. Outdoor Carpet Adhesives: 150 g/L.
 - d. Wood Flooring Adhesive: 100 g/L.
 - e. Rubber Floor Adhesives: 60 g/L.
 - f. Subfloor Adhesives: 50 g/L.
 - g. Ceramic Tile Adhesives: 65 g/L.
 - h. VCT and Asphalt Tile Adhesives: 50 g/L.
 - i. Gypsum Board and Panel Adhesives: 50 g/L.
 - j. Cove Base Adhesives: 50 g/L.
 - k. Multipurpose Construction Adhesives: 70 g/L.

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- l. Structural Glazing Adhesives: 100 g/L.
- m. Single-Ply Roof Membrane Adhesive: 250 g/L.
- n. Other Adhesive Not Specifically Listed: 50 g/L.
- o. PVC Welding Compounds: 510 g/L.
- p. CPVC Welding Compounds: 490 g/L.
- q. ABS Welding Compounds: 325 g/L.
- r. Plastic Cement Welding Compounds: 250 g/L.
- s. Adhesive Primer for Plastic: 550 g/L.
- t. Contact Adhesive: 80 g/L.
- u. Special-Purpose Contact Adhesive (Contact Adhesive That Is Used to Bond Melamine Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
- v. Structural Wood Member Adhesives: 140 g/L.
- w. Top and Trim Adhesive: 250 g/L.
- x. Metal-to-Metal Adhesives: 30 g/L.
- y. Plastic Foam Adhesives: 50 g/L.
- z. Adhesives for Porous Materials (except Wood): 50 g/L.
- aa. Wood Glues: 30 g/L.
- bb. Fiberglass Adhesives: 80 g/L.
- cc. Architectural Sealants: 250 g/L.
- dd. Nonmembrane Roof Sealants: 300 g/L.
- ee. Roadway Sealants: 250 g/L.
- ff. Single-Ply Roof Membrane Sealants: 450 g/L.
- gg. Other Sealants: 420 g/L.
- hh. Sealant Primers for Nonporous Substrates: 250 g/L.
- ii. Sealant Primers for Porous Substrates: 775 g/L.
- jj. Modified Bituminous Sealant Primers: 500 g/L.
- kk. Other Sealant Primers: 750 g/L.
- 2. Prohibited Ingredients: Adhesives and sealants must not contain the following:
 - a. Chloroform.
 - b. Ethylene dichloride.
 - c. Methylene chloride.
 - d. Perchloroethylene.
 - e. Trichloroethylene.
- 3. Additional Requirements: Comply with additional requirements in CALGreen for aerosol adhesives, and small unit sizes of adhesives, and sealant or caulking compounds.

B. Paints and Coatings:

- 1. For field applications, paints and coatings shall comply with VOC limits of California Air Resources Board (CARB) Architectural Coatings Suggested Control Measure (SCM) below, unless more stringent local limits apply. The VOC content limit for coatings that do not meet the definitions for the specialty coatings categories listed

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shall be determined by classifying the coating as flat, nonflat, or nonflat-high gloss coating, based on its gloss.

- a. Flat Coatings: 50 g/L.
- b. Nonflat Coatings: 100 g/L.
- c. Nonflat - High Gloss Coatings: 150 g/L.
- d. Specialty Coatings:
 - 1) Aluminum Roof Coatings: 400 g/L.
 - 2) Basement Special Coatings: 400 g/L.
 - 3) Bituminous Roof Coatings: 50 g/L.
 - 4) Bituminous Roof Primers: 350 g/L.
 - 5) Bond Breakers: 350 g/L.
 - 6) Concrete Curing Compounds: 350 g/L.
 - 7) Concrete/Masonry Sealers: 100 g/L.
 - 8) Driveway Sealers: 50 g/L.
 - 9) Dry-Fog Coatings: 150 g/L.
 - 10) Faux Finishing Coatings: 350 g/L.
 - 11) Fire-Resistive Coatings: 350 g/L.
 - 12) Floor Coatings: 100 g/L.
 - 13) Form-Release Compounds: 250 g/L.
 - 14) Graphic Arts Coatings (Sign Paints): 500 g/L.
 - 15) High-Temperature Coatings: 420 g/L.
 - 16) Industrial Maintenance Coatings: 250 g/L.
 - 17) Low Solids Coatings: 120 g/L.
 - 18) Magnesite Cement Coatings: 450 g/L.
 - 19) Mastic Texture Coatings: 100 g/L.
 - 20) Metallic Pigmented Coatings: 500 g/L.
 - 21) Multi-Color Coatings: 250 g/L.
 - 22) Pretreatment Wash Primers: 420 g/L.
 - 23) Primers, Sealers, and Undercoaters: 100 g/L.
 - 24) Reactive Penetrating Sealers: 350 g/L.
 - 25) Recycled Coatings: 250 g/L.
 - 26) Roof Coatings: 50 g/L.
 - 27) Rust-Preventive Coatings: 250 g/L.
 - 28) Shellacs, Clear: 730 g/L.
 - 29) Shellacs, Opaque: 550 g/L.
 - 30) Specialty Primers, Sealers and Undercoaters: 100 g/L.
 - 31) Stains: 250 g/L.
 - 32) Stone Consolidants: 450 g/L.
 - 33) Swimming Pool Coatings: 340 g/L.
 - 34) Traffic Marking Coatings: 100 g/L.
 - 35) Tub and Tile Refinish Coatings: 420 g/L.
 - 36) Waterproof Membranes: 250 g/L.
 - 37) Wood Coatings: 275 g/L.
 - 38) Wood Preservatives: 350 g/L.

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- 39) Zinc-Rich Primers: 340 g/L.
2. Additional Requirements: Comply with additional requirements in CALGreen for aerosol paints and coatings.
- C. Carpet Systems: All interior carpet materials, including cushion, shall comply with at least one of the following:
1. Carpet and Rug Institute's Green Label Plus program.
 2. VOC-emission limits and testing requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2 (CDPH Standard Method v1.2).
- D. Composite Wood Products: Composite wood products used on the interior or exterior of the building shall have formaldehyde emission rates not greater than the following specified by the California Air Resources Board (CARB), Air Toxics Control Measure (ATCM) for Composite Wood, as tested in accordance with ASTM E1333:
1. Hardwood Plywood (Veneer Core and Composite Core): 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. Medium-Density Fiberboard More Than 5/16 Inch Thick: 0.11 ppm.
 4. Medium-Density Fiberboard 5/16 Inch or Less in Thickness: 0.13 ppm.
- E. Resilient Flooring Systems: Where resilient flooring is installed, at least 80 percent of floor area receiving resilient flooring shall meet the requirements comply with the following:
1. VOC-emission limits and testing requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2 (CDPH Standard Method v1.2).
- F. Thermal Insulation: Thermal insulation products shall comply with VOC-emission limits and testing requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2 (CDPH Standard Method v1.2).
- G. Acoustical Ceilings and Wall Panels: Acoustical ceilings and wall panels shall comply with VOC-emission limits and testing requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2 (CDPH Standard Method v1.2).

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PART 3 - EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT

- A. Construction and Demolition Waste Management: Achieve specified rates for waste management by one of the following:
 - 1. Construction Waste Management Plan: Where a local jurisdiction does not have a construction and demolition waste management ordinance that is more stringent, submit a construction waste management plan that includes the following:
 - a. Identification of construction and demolition waste materials to be diverted from disposal by efficient usage, recycling, reuse on the Project or salvage for future use or sale.
 - b. Determination of construction and demolition waste materials will be sorted on-site (source separated) or bulk mixed (single stream).
 - c. Identification of diversion facilities where construction and demolition waste material collected will be taken.
 - d. Specification of the amount of construction and demolition waste materials diverted shall be taken by weight or volume, but not by both.
 - 2. Waste Management Company: Utilize a waste management company that can provide verifiable documentation that the percentage of construction and demolition waste material diverted from the landfill complies with CALGreen.
 - 3. Waste Stream Reduction Alternative: The combined weight of new construction disposal that does not exceed two pounds per square foot of building area shall be deemed to meet the 65 percent minimum requirement as approved by the enforcing agency.
- B. Enhanced Construction Waste Reduction; Tier 1: Any mixed recyclables that are sent to mixed-waste recycling facilities shall include a qualified third-party verified facility average diversion rate.

3.02 CONSTRUCTION IAQ MANAGEMENT

- A. Cover or close openings in ducts and other related air-distribution component openings with tape, plastic, sheet metal, or other approved method before beginning dust-producing operations and maintain until dust-producing operations are complete.
- B. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period, as specified in Section 01 50 00 "Temporary Facilities and Controls," install MERV 13 filter media according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
 - 1. Replace all air filters immediately prior to occupancy.

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END OF SECTION

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SECTION 02 41 16 – DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:
 - 1. Protection of existing improvements to remain.
 - 2. Cleaning existing improvements to remain.
 - 3. Disconnecting and capping utilities.
 - 4. Removing debris, waste materials, and equipment.
 - 5. Removal of items for performance of the Work.
 - 6. Salvageable items to be retained by the Owner.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 01 1100 - Summary of Work.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

1.03 QUALITY ASSURANCE

- A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.
- B. Prior to commencement of Work, schedule a walkthrough with the OAR, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.
- C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition Work to create least possible inconvenience to the public and facility operations.

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- D. Related Standard: ANSI/ASSE A10.6.

1.04 PROJECT CONDITIONS

- A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.
- B. Repair damage to existing improvements or damage due to excessive demolition.
- C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.
- D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

- A. Items scheduled for salvage by the Owner shall be delivered to a location designated by the OAR. Items shall be cleaned, packaged and labeled for storage.
- B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

- A. Protection:
 - 1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.
 - 2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.
- B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the OAR.

3.02 DEMOLITION

- A. Do not throw or drop materials. Furnish ramps or chutes as required by the Work.
- B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.

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- C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

- A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.
- B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.
- C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF EXISTING PLUMBING AND ELECTRICAL EQUIPMENT AND SERVICES

- A. Remove existing plumbing and electrical equipment fixtures and services not indicated for reuse and not necessary for completion of the Work. Remove abandoned lines and cap unused portions of existing lines.

3.05 REMOVAL OF OTHER MATERIALS

- A. Roofing: Remove as required, including accessory components such as insulation and flashings. At penetrations through existing roofing, trim cut edges back to sound roofing with openings restricted to the minimum size necessary to receive Work.
- B. Sheet Metal: Remove back to joint, lap, or connection. Secure loose and unfastened ends or edges and provide a watertight condition. Re-seal as required.
- C. Modular materials such as acoustical ceiling panels, resilient tile, or ceramic tile: Remove to a natural joint without leaving damaged or defective Work where joining new Work. After flooring removal, clean substrates to remove setting materials and adhesives.
- D. Gypsum Board: Remove to a panel joint line on a stud or support line.
- E. Plaster: Saw cut plaster on straight lines, leaving a minimum 2-inch width of firmly attached metal lath for installing new lath and plaster.
- F. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

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- A. Patch or repair materials to remain when damaged by the performance of the Work of this section. Finish material and appearance of patch and/or repair Work shall match existing.

3.07 CLEANING

- A. Clean existing materials to remain with appropriate tools and equipment.
- B. Protect existing improvements during cleaning operations.
- C. Debris shall be dampened by fog water spray prior to transporting by truck.
- D. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.
- E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.
- F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Wood blocking.
- B. Related Sections:
 - 1. Division 01 sustainable design requirements Section(s) for supplementary sustainable design criteria.

1.02 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.02 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.

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- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine or southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB or WWP.
- C. For blocking used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.03 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Screws for Fastening to Metal Framing: ASTM C954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate blocking and similar supports to comply with requirements for attaching other construction.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.

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- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.

3.02 INSTALLATION OF WOOD BLOCKING

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.03 PROTECTION

- A. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

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SECTION 10 22 13 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Standard-duty wire mesh partitions.
- B. Related Sections:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for solid wood blocking.

1.02 DEFINITIONS

- A. Intermediate Crimp: Wires pass over one and under the next adjacent wire in both directions, with wires crimped before weaving and with extra crimps between the intersections.

1.03 ACTION SUBMITTALS

- A. Product Data:
 - 1. Wire mesh partitions.
 - 2. .
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details of panel and door construction, and hardware.
 - 2. Indicate clearances required for operation of doors.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for units with factory-applied color finishes.
- D. Samples for Verification: Panel constructed of specified frame members and wire mesh. Show method of finishing members at intersections.
 - 1. Size: 12 by 12 inches.

1.04 INFORMATIONAL SUBMITTALS

- A. Delegated Design Submittals: For wire mesh partitions indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Qualification Statements: For Installer.

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- C. Delegated design engineer qualifications.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wire mesh partition hardware.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installers: Minimum 1 year experience installing similar products.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wire mesh items palletted and with cardboard protectors on perimeters of panels and doors and with posts wrapped to provide protection during transit and Project-site storage. Use vented plastic.
- B. Inventory wire mesh partition door hardware on receipt, and provide secure lockup for wire mesh partition door hardware delivered to Project site.
 - 1. Tag each item or package separately with identification, and include basic installation instructions with each item or package.

1.08 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. 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:
 - 1. Acorn Wire & Iron Works, Inc.
 - 2. American Woven Wire Corporation.
 - 3. California Wire Products Corporation.
 - 4. Central Wire and Iron.
 - 5. G-S Company (The).
 - 6. Jesco Industries, Inc.
 - 7. Kenco Wire and Iron Products Inc.
 - 8. King Wire Partitions, Inc.
 - 9. Miller Wire Works, Inc.
 - 10. Newark Wire Works Inc.
 - 11. Standard Wire & Steel Works.

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12. Wire Crafters, LLC.

2.02 SOURCE LIMITATIONS

- A. For wire mesh products, obtain each color, grade, finish, type, and variety from single source with resources to provide products of consistent quality in appearance and physical properties.

2.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 "Quality Requirements," to design wire mesh units.
- B. Structural Performance: Wire mesh units to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft. at any location on a panel.
 2. Total load of 200 lbf applied uniformly over each panel.
 3. Concentrated load and total load need not be assumed to act concurrently.
 4. .
- C. Seismic Performance: Wire mesh units to withstand the effects of earthquake motions determined in accordance with ASCE 7.
- D. Regulatory Requirements: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and California Building Code, Chapter 11 for doors and gates designated as accessible.

2.04 STANDARD-DUTY WIRE MESH PARTITIONS

- A. Mesh: 0.135-inch- diameter, intermediate-crimp steel wire woven into 1-1/2-inch diamond mesh.
- B. Vertical Panel Framing: 1-1/4-by-5/8-by-0.080-inch cold-rolled, C-shaped steel channels with holes for 1/4-inch- diameter bolts not more than 12 inches o.c.
- C. Horizontal Panel Framing: 1-by-1/2-by-1/8-inch cold-rolled steel channels.
- D. Horizontal Panel Stiffeners: Two cold-rolled steel channels, 3/4 by 3/8 by 1/8 inch, bolted or riveted toe to toe through mesh; or one 1-by-1/2-by-1/8-inch cold-rolled steel channel with wire mesh woven through channel.
- E. Top Capping Bars: 2-1/4-by-1-inch cold-rolled steel channels.
- F. Line Posts: 3-inch-by-4.1-lb or 3-1/2-by-1-1/4-by-0.127-inch steel channels; with 1/4-inch steel base plates.

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- G. Floor Shoes: Metal, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with setscrews for leveling adjustment.
- H. Sliding Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch steel channels, banded with 1-1/2-by-1/8-inch flat steel bar cover plates on four sides.
 - 1. Hardware: Two, four-wheel roller-bearing carriers; box track; and bottom guide channel for each door.
 - 2. Cylinder Lock: Mortise type with manufacturer's standard cylinder; operated by key outside and lever inside.
- I. Finish: Powder-coated finish unless otherwise indicated.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.05 MATERIALS

- A. Steel Wire: ASTM A510/A510M.
- B. Steel Plates, Channels, Angles, and Bars: ASTM A36/A36M.
- C. Steel Sheet: Cold-rolled steel sheet, ASTM A1008/A1008M, Commercial Steel (CS), Type B.
- D. Steel Pipe: ASTM A53/A53M, Schedule 40, unless another weight is indicated or required by structural loads.
- E. Steel Tubing: ASTM A500/A500M, cold-formed structural-steel tubing or ASTM A513/A513M, Type 5, mandrel-drawn mechanical tubing.
- F. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.
- G. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.
- H. Post-Installed Anchors: Capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components are zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
- I. Seismic Bracing: Angles with legs not less than 1-1/4 inches wide, formed from 0.040-inch-thick, metallic-coated steel sheet; with bolted connections and 1/4-inch-diameter bolts.

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WIRE MESH PARTITIONS
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2.06 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
 - 1. Fabricate wire mesh items to be readily disassembled.
 - 2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.
- B. Standard- Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
 - 1. Mesh: Securely clinch mesh to framing.
 - 2. Framing: Fabricate framing with mortise-and-tenon corner construction.
 - a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
 - b. Fabricate partition and door framing with slotted holes for connecting adjacent panels.
 - 3. Fabricate wire mesh partitions with 3 to 4 inches of clear space between finished floor and bottom horizontal framing.
 - 4. Doors: Align bottom of door with bottom of adjacent panels.
 - 5. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

2.07 STEEL AND IRON FINISHES

- A. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder-coat finish, suitable for use indicated, with a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors for suitable conditions where wire mesh items will be installed.
- C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.

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WIRE MESH PARTITIONS
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- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF WIRE MESH PARTITIONS

- A. Anchor wire mesh partitions to floor with 3/8-inch- diameter, postinstalled expansion anchors at 12 inches o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
- B. Anchor wire mesh partitions to walls at 12 inches o.c. through back corner panel framing and as follows:
1. For concrete and solid masonry anchorage, use expansion anchors.
 2. For hollow masonry anchorage, use toggle bolts.
 3. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 4. For steel-framed gypsum board assemblies, use lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
- C. Secure top capping bars to top framing channels with 1/4-inch- diameter, "U" bolts spaced not more than 28 inches o.c.
- D. Provide line posts at locations indicated or, if not indicated, as follows:
1. On each side of sliding-door openings.
 2. For partitions that are 7 to 9 ft. high, spaced at 15 to 20 ft. o.c.
- E. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.
- F. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
- G. Install doors complete with door hardware.
- H. Bolt accessories to wire mesh partition framing.

3.03 REPAIR

- A. Repair Painting:
1. Wire brush and clean rust spots, welds, and abraded areas immediately after installation, and apply repair paint with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

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WIRE MESH PARTITIONS
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3.04 ADJUSTING

- A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Verify that latches and locks engage accurately and securely without forcing or binding.

3.05 PROTECTION

- A. Remove and replace defective work, including doors and framing that are warped, bowed, or otherwise unacceptable.

END OF SECTION

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SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies the basic requirements for electrical installations and includes requirements common to more than one section of Division 26. It expands and supplements the requirements specified in sections of Division 01.
- B. Related Requirements:
 - 1. Division 01 – General Requirements.
 - 2. Section 03 3000 – Cast-in-Place Concrete.
 - 3. Section 09 9000 – Painting and Coating.
 - 4. Division 14 – Conveying Equipment.
 - 5. Division 26 – Electrical.
 - 6. Division 27 – Communications.
- C. Related Industry Standards: The most current version of the following industry standards.
 - 1. ASTM D 709 – Laminated Thermosetting materials.
 - 2. ANSI/NEMA FB-1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
 - 3. ANSI/NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 4. California Electrical Code (CEC).
 - 5. IEEE C57.12.28 – Standard for Pad-Mounted equipment Enclosure Integrity.
 - 6. IEEE 1584 – Performing Arc-Flash Hazard Calculations.
 - 7. UL/ANSI 1 – Standard for Flexible Metal Conduit.
 - 8. UL/ANSI 1242 – Standard for Electrical Intermediate Metal Conduit.
 - 9. UL/ANSI 506 – Standard for Specialty Transformers.
 - 10. UL/ANSI 6 – Electrical Rigid Metal Conduit-Steel.
 - 11. UL/ANSI 6A – Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel.
 - 12. UL 797 – Electrical Metallic Tubing-Steel.
 - 13. UL/ANSI 870 – Standard for Wireways, Auxiliary Gutters, and Associated Fittings.

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14. UL/ANSI 891 – Standard for Safety Switchboards.

1.02 BASIC ELECTRICAL REQUIREMENTS

A. Quality Assurance:

1. Work shall be performed by CONTRACTOR'S personnel possessing the skills and experience obtained in performing work of similar scope and complexity.
2. Refer to related division(s) specifications for other requirements.

B. Drawings and Specifications Coordination:

1. For purposes of clearness and legibility, Drawings are essentially diagrammatic, and the size and location of equipment is indicated to scale whenever possible. Verify conditions, dimensions, indicated equipment sizes, and manufacturer's data and information as necessary to install the Work of this Division. Coordinate location and layout with other Work.
2. Verify final locations for rough ins with field measurements and with the requirements of the equipment to be connected.
3. Drawings indicate required size and points of termination of conduits, number and size of conductors, and diagrammatic routing of conduits. Install conduits with minimum number of bends to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and comply with applicable code requirements.
4. Routing of conduits may be changed provided that the length of any conduit run is not increased more than 10 percent of length indicated on the Drawings.
5. Outlet locations shall be coordinated with architectural elements prior to start of construction. Locations indicated on the Drawings may be distorted for clarity; CONTRACTOR shall coordinate in the field prior to rough-in work.
6. Coordinate electrical equipment and materials installation with building components and the Work of other trades.
7. Equipment disconnects shall be readily accessible and free of obstructions.
8. When extending or intercepting existing electrical facilities, CONTRACTOR shall Coordinate and verify existing conditions.

C. Terminology:

1. Signal Systems: Applies to clock, bell, fire alarm, annunciator, sound, public address, buzzer, telephone, television, inter-communication, elevator access controls, lighting control systems and security systems.
2. Low Voltage: Applies to signal systems operating at 120 volts and less, and power systems operating at less than 600 volts. Medium voltage: Applies to power systems operating at more than 600 volts.

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3. UL: Underwriter's Laboratories Inc, Nationally Recognized Testing Laboratory (NRTL), or equal.
- D. Regulations: Work shall comply with the requirements of authorities having jurisdiction and the California Electrical and Building Codes. Material shall conform to regulations of the National Board of Fire Underwriters for electrical wiring and apparatus. Materials shall be new and listed by UL, or another NRTL.
- E. Structural Considerations for Conduit Routing:
 1. CONTRACTOR shall provide DSA approved calculations and drawings as necessary for any construction and/or alterations requiring conduits to pass through or interfere with any structural members, or where notching, boring or cutting of the structure is necessary, or where special openings through walls, floors, footings, or other buildings elements, or where notches and bored holes in wood or steel are required. All work shall conform to CBC, Part 2, Title 24 requirements.
 2. Concrete encasement for underground conduits that abuts a foundation wall or underground structure shall rest on a haunch integral with wall or structure, or shall extend down to footing projection, or shall be doweled into structure unless otherwise indicated. Underground structures shall include maintenance holes; pull boxes, vaults, and buildings.
- F. Electrically Operated Equipment and Appliances:
 1. Furnished Equipment and Appliances:
 - a. Work shall include furnishing and installing wiring enclosures and complete connections of electrically operated equipment, appliances and electrical control devices, which are specified to be furnished and installed in this or other sections of the Specifications. Wiring enclosures shall be concealed except where exposed work is indicated on the drawings.
 - b. Provide all connections necessary for installation of equipment.
 - 1) Equipment shall be tested for proper operation, including proper rotation of motorized equipment.
 - 2) If outlets are of incorrect electrical characteristics, or any specified equipment fails to operate properly, CONTRACTOR shall repair and/or replace the outlet and/or equipment.
 - 3) Utility connections (electrical, controls, gas, etc.) to roof mounted mechanical equipment shall be made through the side of the equipment and not from beneath the unit to facilitate future replacement.

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2. Equipment and Appliances Furnished by Others:
- a. Equipment and appliances indicated on Drawings as "not in contract" (NIC), "furnished by others," or "furnished by the OWNER," will be delivered to the Project site. Required electrical connections shall be performed for such equipment and appliances. Motorized equipment will be furnished factory-wired to a control panel or junction box unless otherwise indicated. Appliances will be furnished equipped with portable cord and cap. Provide disconnect switches where required.
 - b. Connections to equipment furnished under this Division shall be part of the Work of this section. Work shall include internal wiring, installation, connection and adjustment of bolted drive motors in which the motor is supplied as a separate unit, and connections only for equipment furnished with factory installed internal wiring, except as further limited by Drawings and this Specification. Work shall include furnishing and installing suitable outlets, disconnecting devices, starters, push-button stations, selector switches, conduit, junction boxes, and wiring necessary for a complete electrical installation. Work shall also include furnishing and installing conduit and boxes for HVAC control systems, furnished under Division 23. Devices and equipment furnished shall be of same type used elsewhere on the Work or as specified.
 - c. Electrical equipment furnished under other sections, for installation and connection under Work of this section, will be delivered to the Project site ready for installation.
 - d. Mechanical equipment furnished under other sections, and requiring electrical connection under this section, will be set in place as part of the Work of the section furnishing such equipment unless noted otherwise.
 - e. Suitability and condition of equipment furnished under other sections shall be determined in advance of installation. Immediate notice of damage, unsuitability, or lack of parts shall be given to the entity providing such equipment.
- G. Power Distribution System Reports: For fault current, coordinatization and Arc-Flash system report requirements refer to applicable electrical distribution equipment sections. for specific requirements.
- H. Protection of Materials:
- 1. Protect materials and equipment from damage and provide adequate and proper storage facilities during progress of the Work. Damaged materials and/or equipment shall be replaced.
- I. Cleaning:
- 1. Exposed parts of Work shall be left in a neat, clean, usable condition. Finished painted surfaces shall be unblemished and metal surfaces shall be polished.

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2. Thoroughly clean parts of apparatus and equipment. Exposed parts to be painted shall be thoroughly cleaned of cement, plaster, and other materials. Remove grease and oil spots with solvent. Such surfaces shall be wiped, and corners and cracks scraped out. Exposed rough metal shall be smooth, free of sharp edges, carefully steel brushed to remove rust and other spots, and left in proper condition to receive finish painting.
3. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

J. WARRANTIES

1. Provide one-year warranty on all material and labor performed, unless noted otherwise in specific sections.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Advise the Inspector before starting the Work of this Division.
- B. Exposed conduits shall be painted to match the surfaces adjacent to installation.
- C. Salvaged materials removed from buildings shall be removed from the Project site as required by the OAR.
- D. Trenches outside of barricade limits shall be backfilled and paved within 24 hours after being inspected by the Inspector. Provide traffic plates during the time that trenches are open in traffic areas and in areas accessible to students and staff.
- E. Where existing structural walls are cored for new conduit runs, separation between cored holes shall be three inches edge to edge from new or existing holes, unless otherwise required by the Architect. All coring to be laid out and reviewed by Architect prior to drilling. CONTRACTOR to verify location of structural steel, rebar, stress cabling or similar prior to lay out.
- F. Electrical equipment shall be braced and anchored for CBC Seismic Design requirements, or as otherwise indicated on the Drawings.

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3.02 DELIVERY STORAGE AND HANDLING

- A. Deliver products to project site with proper identification, which shall include names, model numbers, types, grades, compliance labels, and similar information needed for District identification; all products and materials shall be adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion.

3.03 CUTTING AND PATCHING

- A. Cutting and patching of electrical equipment, components, and materials shall include the removal and legal disposal of selected materials, components, and equipment.
- B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.
- C. Repair or restore other work or surfaces damaged as a result of the work performed under this contract.

3.04 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose off the Project site.
- B. Remove equipment and implements of service, and leave entire work area neat and clean, to the satisfaction of the OWNER Authorized Representative.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

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SECTION 26 05 13 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Boxes, enclosures, keys and locks.
 - 2. Receptacles and switches.
 - 3. Identifications and signs.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Division 26 – Electrical.
 - 3. Division 27 – Communications.

PART 2 - PRODUCTS

2.01 BOXES, ENCLOSURES, KEYS AND LOCKS

- A. Outlet Boxes and Fittings:
 - 1. Outlet boxes installed in concealed Work shall be galvanized steel, pressed, or welded type, with knockouts.
 - 2. In exposed Work, where conduit runs change direction or size, outlet boxes and conduit fittings shall be malleable (FS type) metal with threaded hubs integral with box or fitting.
 - 3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium-plated, or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of cracks, gas holes, flaws, excessive shrinkage, and burnt-out sand.
 - 4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for the fitting installed.
 - 5. Light fixture outlets shall be 4-inch octagon, 4-inch square, 2 1/8-inch deep, or larger based on code requirements for the number of conductors and conduits.
 - 6. Plaster rings shall be furnished with round opening with two ears drilled 2 23/32 inches center to center.

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7. For local device outlets provide 4-inch square 2 1/8-inch deep, boxes for single gang, 5-inch square boxes for two-gang, and special solid gang boxes with gang plaster ring for more than two switches.
8. For horns and strobes provide manufacturer's supplied back box as needed.
9. For television outlets, provide 4-gang deep boxes and 4-gang plaster rings.
10. Plaster rings shall be provided on flush-mounted outlet boxes except where otherwise indicated or specified. Plaster rings shall be same depth as finished surface. Install approved ring extension to obtain depth to finish surface.
11. In existing plywood wall or drywall construction, and where flexible steel conduit is fished into walls, single-gang and 2-gang outlets for wiring devices may be sectional steel boxes with plaster ears. Boxes shall be fastened to plywood with flat-head screws in each plaster ear screw hole. Boxes fastened to gypsum board shall be Racor, Appleton, Cooper, Bowers, or equal.
12. Altered knockouts shall be sealed with properly NEMA rated factory made knockout seals.
13. Provide and install weatherproof universal box extension adapters where flexible conduit is extended from flush outlet boxes.

B. Junction and Pull boxes:

1. Junction and pull boxes shall only be used in compliance with codes, recognized industry standards, and contract documents.
2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel, boxes shall be provided with ample laps, be spot welded, and be rigid under torsion and deflecting forces. Furnish auxiliary angle iron framing where necessary to ensure rigidity.
3. Covers shall be fastened to box with enough machine screws to ensure continuous. Flush type boxes shall be drilled and tapped for cover screws if boxes are not installed plumb.
4. Surfaces of pull and junction boxes and covers shall be labeled with black marker ink designating system, panelboard and circuit designation shall be indicated in box interiors. In exposed Work, designation shall be located on inside of pullbox or junction box cover.
5. Weatherproof NEMA 3R pull and junction boxes installed in buildings interior shall conform with the following:
 - a. Cover of flush mounting boxes shall be furnished with a weather-tight gasket cemented and trimmed even with cover all around.
 - b. Surface or semi-flush mounted pull and junction boxes shall be listed by UL or another Nationally Recognized Testing Laboratory (NRTL) as rain-tight and be furnished complete with threaded conduit hubs.

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- c. Exposed portions of boxes shall be galvanized, finished with one prime coat and one coat of baked-on gray enamel, unless box(es) are already furnished with factory baked-on finish.
- 6. Junction and pull boxes shall be rigidly fastened to structure. Junction and pull boxes shall not depend on conduits for support. Plastic anchors or EZ (drywall type) anchors shall not be used.
- 7. Underground Concrete Pull Boxes:
 - a. Pre-cast concrete pull boxes. Concrete pull boxes shall be traffic type, reinforced for H20-wheel loading, pre-cast concrete. Pull boxes with inside dimensions of 2 feet by 3 feet by 3 feet deep shall consist of a base section, top ring, and cover. Base section shall be furnished with 2 knockouts measuring 10 inches by 10 inches in each 3 feet side, and one 20 inches by 20 inches knockout in each 2-foot side. Pull boxes with inside dimension 4 feet by 4 feet by 4 feet deep shall consist of a base section, midsection, topping, and cover. Base section shall be furnished with 2 knockouts measuring 8-inch by 16-inch on each of two opposite sides, and one 20-inch by 20-inch knockout on each of other two opposite sides. Pull boxes shall be furnished with a minimum of 6-inch diameter sump knockout and one-inch diameter ground rod knockout.
 - b. Provide pull boxes with installed cable racks on interior walls. Racks shall be furnished with 3 porcelain cable holders on vertical steel mounting bars. All racks shall be effectively grounded.
 - c. Pull boxes shall be furnished with 3/4-inch diameter pull irons. Covers shall be traffic-type consisting of steel safety plate(s) bolted to frame. Covers shall be marked as electrical, power, or signal as required, and shall have code approved size openings for lifting the cover.
 - d. Boxes larger than 2 feet wide by 3 feet in length shall have hinged two section traffic type covers that comply with other requirements indicated herein.
 - e. Underground pull boxes without a concrete base are not acceptable.
 - f. Provide end bells in duct entrances and terminate them flush to inside of vault.
 - g. Terminate each metal conduit with insulated bushings. Effectively ground bushings at grounding terminals.
 - h. Install pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.
 - i. Remove floor drain knockout and provide a depth of 24 inches of crushed rock below box extending a minimum of 12 inches beyond on all sides.
 - j. Permanently and effectively ground metal equipment cases, cable racks, pull box covers/lids, and similar items in pull boxes to site grounding

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electrode system. Provide grounding conductor in compliance with CEC Article 250.

- k. Provide 6-inch deep sand base under pull boxes and a black cloth between sand and rock.
 - l. Identify power and signal cables by tagging in manholes and pull boxes. Tie securely to cables with nylon cord.
 - m. Top of steel plate shall provide a minimum coefficient of static friction of 0.5 for either wet or dry locations, when tested for any shoe sole material. Test shall comply with ASTM D 2047 or F 489 or F 609 standards. Submit manufacturer's test results for Architect's review as part of materials and equipment submittals.
 - n. The use of underground extension boxes shall be limited to not more than ½ times the original depth of pull box.
 - o. Manhole type boxes are not acceptable.
 - p. Approved Products: Oldcastle Precast, Jensen Precast, Kistner, Western Precast, or OWNER approved equal.
8. Underground utility boxes shall be reinforced concrete with non-setting shoulders to prevent settlement following installation. Boxes shall be furnished with cast iron cover with finger hole, size as indicated on Drawings. Utility boxes shall be as manufactured by Oldcastle, Jensen, Kistner, Western Precast, or equal.
9. Manholes, vaults, and pull boxes required by a utility company, and installed as part of this Contract, shall meet requirements of servicing utility company.

C. Floor Outlets:

- 1. Floor Outlets (except for extension outlets) shall be cast iron, watertight floor boxes with flush brass floor plates, and shall be set to finish flush with finish floor covering, whether it be carpeted, wood, resilient floor covering, or other finish materials.
 - a. Floor boxes shall be used in offices, classrooms, and in library areas only.
 - b. Approved Products: Harvey Hubbell Inc. B-2503, Thomas & Betts 640 series, Legrand Omnibox, or OWNER approved equal.
- 2. Telephones above floor outlets, where not subject to water, shall be provided with Harvey Hubbell Inc. SC-3098 pedestals with SC309T plates. Refer to other Division 26 sections. Floor boxes shall be used in offices, classrooms and in Library areas only.
 - a. Approved Products: Legrand 525 series, Thomas & Betts FPT-400 Series, or OWNER approved equal
- 3. Plugs above floor outlets where not subject to water shall be provided with pedestals and device plates. Refer to other Division 26 sections. Floor boxes shall be used in offices, classrooms, and library areas only.

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- a. Approved products: Pedestals shall be Legrand 525 series, Thomas & Betts FPT-400 Series. Device plates shall be Hubbell SS309D, or District approved equal.
 4. Two gang and single box pedestal boxes shall be listed for wet locations where subject to water. Provide required cover plates.
 - a. Floor outlets shall be used in Cafeteria, Cafeteria serving areas, or any areas where floors are subjected to water.
 - b. Approved products: Single gang boxes - Hubbell SA-6687. Two gang boxes shall be Hubbell SA-6687D, or OWNER approved equal.
 5. Extension floor outlets shall be cast iron with cast iron covers, and 1/2-inch offset entries for above-floor conduit extensions; Boxes shall be designed to permit access to wiring without disturbing above-floor extensions and shall be set flush with finish floor.
 6. Above floor service fittings for data outlets and surge suppression receptacles shall be faceplate interchangeable, die cast aluminum.
 - a. Approved products: Hubbell SC3098 with cover plates SS309DS, Legrand 525 series, Thomas & Betts FPT-400 Series, or OWNER approved equal.
- D. Floor Pockets – Plugging Boxes:
1. Three-Gang floor lighting pockets shall be flush floor type recess floor mounted enclosure, with cast iron floor plate and hinged cast iron door notched for cables.
 - a. Each floor pocket shall be provided with three 20-amp, 3 wire, 120-volt receptacles with matching caps.
 - b. Approved products: Legrand or Hubbell Recessed Floor Boxes, C.W. Cole TLS 353-6, or equal, for wood floors and C.W. Cole TLS-353-6-C, or OWNER approved equal for concrete slabs.
 2. Single Gang:
 - a. Receptacle floor pockets shall be single gang, flush floor type, with cast iron floor plate, hinged cast iron door notched for cable and cast-iron box. Provide each pocket with a standard, single grounding type receptacle unless otherwise indicated.
 - 1) Approved Products: C.W. Cole TLA-362-1-FE, or OWNER approved Legrand or Hubbell recessed floor box, or OWNER approved equal. For wood floors provide C.W. Cole TLS-362-1, or OWNER approved equal.
 - b. Microphone or projector floor pockets shall be single gang flush floor type with cast iron floor plate, hinged cast iron door, notched for cable and cast-iron box.

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- 1) Approved Products: Legrand or Hubbell recessed floor box, C.W. Cole TLA-362-3-FE, C.W. Cole TLS-362-3, in wood floors, or OWNER approved equal.

E. Keys and Locks:

1. Provide two keys with furnished door locks, including cabinet door locks and switchboard locks, two keys for lock switches on switchboards or control panels, and two keys with interlocks or other furnished lock switches. Deliver keys to OAR.
2. Special keys and locks shall only be provided where specified. Locks shall be keyed to Corbin No. 60 or 70 as follows:
 - a. Access to operate equipment shall be keyed to Corbin 60.
 - b. Access to service areas shall be keyed to Corbin 70.

2.02 RECEPTACLES AND SWITCHES

A. Receptacles:

1. Duplex receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be wired on the side and back with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be PVC. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts. Approved products:

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
(20 amps) NEMA 5-20	PS5362-I	HBL5362-I	5362-I
(15 amps) NEMA 5-15	PS5262-I	HBL5262-I	5262-I

Equal products approved by OWNER may be acceptable.

2. Duplex receptacles on circuits supplied by panel boards with integral surge suppression shall be:

Pass & Seymour model number PS5262BL (blue).

Hubbell DRUBTVSS15.

Leviton 5262-SBU, 15-amps, 120-volts.

Equal products approved by OWNER may be acceptable.

3. Single receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be back and side wire with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be thermoplastic. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts. For circuits consisting of one single receptacle only, ampere rating of receptacle shall be same as circuit breaker or fuse. Approved products:

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
(20 amps) NEMA 5-20R	5361-I	HBL5361-I	5361-I

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(15 amps) NEMA 5-15R 5261-I HBL5261-I 5261-I
Equal products approved by OWNER may be acceptable.

4. Single 15 and 20-amps receptacles on circuits supplied by panel boards with integral surge suppression shall be blue in color. Approved products:

Pass & Seymour NEMA 5-20R model number 5361-BL (blue).
NEMA 5-15R model number 5261-BL (blue).
OWNER approved equal.

5. Ceiling Mounted Retractable Power Cord Receptacles. Duplex 20-amps heavy duty retractable cord reel with cord length and color as indicated in drawings, Reel shall be equipped with lift/drag ratchet lock and be NEMA 5-20 cap. listed industrial grade steel housing with welded steel frame.

Approved Manufactures: KH Industries RTB series, REELCRAFT H-7122, or OWNER approved equal.

6. Kiln and range receptacles. provide 3-pole, 4-wire, grounding type, rated 50 amps or as indicated on plans. Receptacle shall be rated 125/250 volts NEMA 14-50R. Provide 2-gang, stainless steel plates. Approved products:

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
NEMA 14-50R	3894	HBL9450A	279
WALL PLATE	SS703	S703	84026

Equal products approved by OWNER may be acceptable.

7. Dryer receptacles. Provide 3-wire, non-grounding type, rated 30 amps at 125/250 volts, NEMA 10-30R, with 2-gang stainless steel plates. Coordinate location of junction box with the work of Section 10 2815, Hand and Hair Dryers. Approved Products:

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
<u>NEMA</u> 10-30R	3860	HBL9350	5207
<u>WALL</u> PLATE	SS703	S703	84026

Equal products approved by OWNER may be acceptable.

8. Provide specification grade ground-fault circuit interrupter (GFCI) type receptacles in accordance with 2010 UL standards. GFCI receptacles shall have a trip indication light. Receptacle terminal screws shall be back and side wire with internal screw pressure plates. Test and reset buttons shall match device body and shall be ivory. GFCI receptacles shall be manufactured in standard configuration for installation with stainless steel smooth plates. Exterior mounted receptacles shall be mounted inside weatherproof enclosure. Approved products: Provide student restroom receptacles mounted at 80 inches above finished floor with lockable CAT 60 stainless steel cover.

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
NEMA 5-20R	2097TRI	GFRST20IB	G5362-WTI
NEMA 5-15R	1597TRI	GFRST15IB	G5262-WTI

Equal products approved by OWNER may be acceptable.

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9. Provide weatherproof receptacles as indicated or specified, Receptacles shall be GFCI type receptacles, with metal plates with die-cast lockable hinged lids and weatherproof mats. Receptacles shall be tamper-resistant with thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects. Receptacles shall have extra heavy-duty brass, and one-piece mounting strap with integral ground. Receptacles shall be ivory color, impact resistant nylon face and back body. Approved products:

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Arrow Hart</u>	<u>Leviton</u>
NEMA 5-20R	TR63-I	TR8300V	8300SGI
NEMA 5-15R	TR62-I	TR8200V	8200SGI

Equal products approved by OWNER may be acceptable.

10. Standard GFCI cover plates shall be Pass & Seymour 4600, Raco 5028-0, or equal. GFI cover plates shall be provided with a CAM lock mechanism with two keys or a padlock hasp that does not protrude through the face of the cover and will allow the shank of locks keyed Corbin No. 60 keys.
11. Provide transient voltage surge suppression (TVSS) receptacles offering metal oxide varistors (MOVs) protecting normal and common modes, (L-N, L-G, N-G) with 500V suppressed voltage. TVSS devices shall offer 3-mode equal protection with 210 joules minimum per mode of energy absorption and 13,000-amp maximum surge capability. TVSS devices shall have 3 thermal fuses and two over-current protection fuses. TVSS devices shall have LED visual only surge status indicator to alert user to surge suppression circuit condition. Visual indicator will be illuminated (red) when power is on and surge suppression circuit is fully functional. Visual indicator will not be illuminated when power is off or unit experiences loss of surge suppression protection. Terminals shall be back and side wire including ground terminal. Color shall be blue. Approved Products

<u>NEMA #</u>	<u>Pass& Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
NEMA 5-20R	5352BLSP	HBL5360SA	5380B
NEMA 5-15R	5252BLSP	HBL5260SA	5280B

Equal products approved by OWNER may be acceptable.

B. Switches

1. Local Switches:

- a. Local switches shall be high strength thermoplastic toggle, industrial grade, rated 20 amps at 120-277 volts AC only, with plaster ears, external screw pressure plate back and side wired, and standard size composition cups which fully enclose mechanism. Switches shall be approved for installation at currents up to full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80 percent of rating for motor loads. Switches shall have oversized silver alloy contacts for long life and better heat dissipation. Provide switches as single pole, double pole, 3-

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way, 4-way, non-lock type. Provide non-lock type switches with ivory handles;

	<u>Pass & Seymour</u>	<u>Hubbell</u> <u>Leviton</u>
Single pole	PS20AC1I 1221-2I	HBL1221I
Double pole	PS20AC2I 1222-2I	HBL1222I
Three-way	PS20AC3I 1223-2I	HBL1223I
Four-way	PS20AC4I 1224-2I	HBL1224I

Equal products approved by OWNER may be acceptable.

- b. Lock type switches shall be specification industrial grade, 20 amp, 120-277 volts with metal or nylon key guides with on/off indication, and operable by same key. Key shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16-inch long forks, 5/32-inch spacing between forks and 5/16-inch width overall. Approved products:

	<u>Pass & Seymour</u>	<u>Arrow Hart</u>
Single pole Key	PS20AC1L w/#500 Key-2L	1221L w/1201LK
Double pole Key	PS20AC2Lw/#500 Key	1222L w/1201LK
Three-way Key	PS20AC3L w/#500 Key	1223L w/1201LK
Four Way Key	PS20AC4L w/#500 Key	1224L w/1201LK

Equal products approved by OWNER may be acceptable.

- c. Rotary lock switches shall incorporate a tumbler type lock to prevent unauthorized operation. Lock shall be tumbler type by Corbin, keyed to a HH41 key. Lock switch to be installed with pin tumblers facing downward. Key shall be removable in all positions. Each device shall be complete with 2 keys. Keys shall be delivered only to the OAR. Switches shall be rated at 20 amps, 120-volt or 277-volt AC. Switch plates shall be of stainless steel, engraved with on and off positions indicated. Approved products:

	<u>Arrow Hart</u>
Single pole	AH1191N
Double pole	AH1192N
Three-way	AH1193N

Equal products approved by OWNER may be acceptable.

- d. Pilot light switches shall be rated 20 amps and shall conform to specifications for local switches. Switches shall be furnished with red,

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Lexan handles that are lighted by LED lamps. Pilot light shall light when load is on. Approved products for 120 and 277 Volts:

- 1) Pilot light 120-Volt switches. Approved products. Approved products:

	<u>Pass& Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
Single pole	PS20AC1-RPL	HBL1221-PL	1221-PLR
Double pole	PS20AC2-RPL	HBL1222-PL	1222-PLR
Three-way	PS20AC3-RPL	HBL1223-PL	1223-PLR

Equal products approved by OWNER may be acceptable.

- 2) Pilot light 277-Volt switches shall be single pole and shall conform to specifications for local switches, and the requirements of paragraph d above. Approved Products:

<u>Pass & Seymour</u>	<u>Leviton</u>	<u>Hubbell</u>
PS20AC1-RPL	1221-7PR	HBL1221-PL7

Equal products approved by OWNER may be acceptable

- e. Provide remote control switches for mechanically held contactors arranged for 3-wire control, toggle type, momentary contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclose mechanism, and ivory handles. Approved products:

<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
1251-I	HBL1557-I	1285-I

Equal products approved by OWNER may be acceptable.

- f. Provide remote control switches for magnetically held contactors arranged for 3-wire control, toggle type, maintained contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclosed mechanism, and ivory handles. Approved products:

<u>Pass and Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
1225-I	HBL 1385	1285-I

Equal products approved by OWNER may be acceptable.

- g. Momentary Contact locking key type switch. 20A 120/277V center off. Key shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16" long forks, 5/32" spacing between forks and 5/16" width overall. Approved products:

Arrow Hart AH1995L w/ AH2000 key

Equal products approved by OWNER may be acceptable.

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- h. Momentary Contact switch low voltage 1 pole 3A 24VAC 3 position center off. Key for locking switch shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16" long forks, 5/31" spacing between forks and 5/16" width overall. Approved products:

Pass and Seymour Toggle 1081I, Locking 1081KGRY w/#500 Key.
Equal products approved by OWNER may be acceptable.

2. Time Switches and Photoelectric Controls for existing construction.

- a. Provide time switches with a 7-day, solid-state, electronic type capable of fully automatic or manual operation and housed in a sheet steel enclosure unless built into a panel or switchboard. Resistive or inductive contacts rated for 25-amps, each pole 240-VAC; 5-amps tungsten or 277-VAC pilot duty, each pole 240-VAC. Time switches to contain a non-volatile clock and non-volatile memory with a built-in rechargeable super capacitor power carry-over system. Battery carryover is not acceptable. Provide a minimum of 15 on/off set points per week. Timing to be in one-minute increments with a minimum on or off time of one minute. Time switch digital displays to indicate days of week, hours, and minutes. Display to contain a load status light to indicate when equipment is in operation.
- b. Required additional features:
 - 1) Liquid crystal display panel.
 - 2) Holiday scheduling: Up to 40 dates may be assigned special holiday schedules, up to one year in advance.
 - 3) Automatically adjusts to and from daylight savings time and for leap year.
 - 4) Contact ratings: 10 amp at 240 VAC.
 - 5) Safety override switch for each circuit to either provide shut down of circuit or to override on.
 - 6) Selective review: All or part of schedule shall be displayed at touch of a key.
 - 7) Super Capacitor for power carry-over system.
 - 8) Supply voltage: 120/277-Volt.
 - 9) 365-day advance scheduling.
- c. Approved products: Tork Model EW 101B series, Intermatic ET2845CP series, or OWNER approved equal.
- d. Photoelectric control: Shall be rated 2,000 watts, 120V with single pole, single throw, normally closed contact, enclosed in a die-cast aluminum

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gasketed enclosure with 1/2-inch conduit fitting. Approved products: Tork series 2100, or OWNER approved equal.

3. Heavy Duty Disconnect Switches

- a. Heavy duty type switches shall be 240 volts or 480 volts as required, totally enclosed, externally operated, with quick-make, quick-break operating mechanism, interlock cover, and provisions for locking cover in closed position and locking switch in on and off positions. Switches shall be single throw, unless otherwise indicated or specified. Switches controlling direct current loads shall be DC rated.
- b. Switches shall be furnished with fully visible switch blades in off position when switch door is open. Current carrying parts shall be plated to resist corrosion and promote cool operation.
- c. Switches shall be furnished with removable arch suppressors where necessary to permit easy access to line side lugs. Lugs shall be front removable.
- d. Switches shall be UL or NRTL listed and shall comply with NEMA Standard KS-1. and UL, or other Nationally Recognized Testing Lab listed for no less than 75 degrees C. copper wires.
- e. Switch enclosure shall be NEMA Type 1 for indoor locations, and NEMA Type 3R, rainproof for outdoor locations.
 - 1) NEMA Type 3R enclosures shall be manufactured from galvanized steel with gray baked enamel and shall be furnished complete with rainproof bolt on hubs.
 - 2) Covers shall be attached with pin type hinges. Removable closing cap types are not permitted.
 - 3) In kitchen area, provide disconnect switchers in a NEMA type 4 stainless steel enclosure.
- f. Quick release latches shall be permitted only when switches are furnished tamper resistant.
- g. Switches shall be furnished with Corbin 66 locks keyed to Corbin 60 key.
- h. Switches shall be fusible or non-fusible as indicated on Drawings. Fusible switches shall accept cartridge fuses.
- i. Current rating of switches, number of poles, solid neutral facilities, and current rating of fuses shall be as indicated on Drawings.

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- j. Switches shall have proper horsepower rating equal to or greater than horsepower of motor controlled. Only lower horsepower rating of dual rated switches will be permitted as a switch rating. Switches shall accept Class H, Class J, and Class R fuses.
 - k. Padlocking device shall lock operating handle and cover with one padlock regardless of on or off position. Furnish a minimum of two padlocks and two keys with each switch. Padlocks shall be Corbin No. 66 keyed to Corbin No. 60 keys.
 - l. Furnish one spare fuse for each fusible disconnect switch installed. Spare fuses shall be same type and rating as those installed.
 - m. Square D, General Electric, Cutler Hammer or equal approved by OWNER.
4. Emergency Lighting Control Unit
- a. The Emergency Lighting Control Unit shall provide all required functionality to allow a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.
 - b. The emergency lighting control unit shall allow control of emergency lighting fixture in tandem with normal lighting in an area while ensuring that emergency lighting will turn on immediately to full brightness upon loss of normal power supplying the control device. Emergency lighting operation shall be independent for each controlled area and shall not require a generalized power failure for proper operation.
 - c. The device shall have normally closed dry contacts capable of switching 10-amp emergency ballast loads at 120-277 VAC, 60 Hz., 2-amp tungsten loads at 120 VAC, 60Hz., LED loads at 120-277V VAC, 60 Hz
 - d. The device shall have universal rated voltage inputs provided for normal power sense and normal switched power at 120-277 VAC, 60 Hz.
 - e. The device shall provide separate LEDs to indicate the presence of normal and emergency power sources. The LEDs shall indicate the unit's current operational mode (normal or emergency)
 - f. The device's normal power input terminal shall be connected to the line side of the control device such that any upstream fault causing a loss of power, including the tripping of the branch circuit breaker, will force the unit into the emergency mode and turn on the emergency lighting.
 - g. The unit shall automatically switch emergency lighting on and off as normal lighting is switched. When normal power is not available, the unit shall force and hold emergency lighting on regardless of the state of any external control device until normal power is restored.

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- h. Approved products: WattStopper ELCU-100 Emergency Lighting Control Unit, LVS #EPC-PM Series, Lighting Control Design #GR 2001 series, or OWNER approved equal.
- 5. School Main Entrance Intercom Station: Refer to specification section 28 1000 – Access Control System.
- 6. Kitchen Service Entry Doorbell and buzzer: Provide 24-Volts heavy duty corrosion resistant doorbell and buzzers. Buzzer shall sound in the kitchen's office and kitchen's work area. Push button shall be protruding type, AC or DC up to 48 volts. Protruding button shall have a polish anodized aluminum shell, snap fit or locknut mounted with normally open momentary contacts.
 - a. Approved Products: Bell and Buzzer - Edwards AdaptaBuzzer 343A series, Edwards Adaptabel 340-Gridor OWNER approved equal.
 - b. Push button – Edwards Recessed Center Push Button 694-B, or OWNER approved equal.

2.03 IDENTIFICATION AND SIGNS

A. Identification Plates:

- 1. Provide identification plates for the following unless otherwise specified, for switchboards, unit substations, motor control centers, control panels, push-button stations, transformers, time switches, contactors, motor starters, motor switches, panelboards, and terminal cabinets.
- 2. Identification plates shall be of plastic stock and shall adequately describe function, voltage and phase of identified equipment. Where identification plates are detailed or described on Drawings, inscription and size of letters shall be as indicated. For lighting and power panels, identification plates shall indicate panel designation, voltage, and phase of panel. For terminal cabinets, identification plates shall indicate system contained in terminal cabinet.
- 3. Identification plates shall be black-and-white nameplate stock of bakelite with characters cut through black exposing white. Plates shall be furnished with beveled edges and shall be securely fastened in place with No. 4 Phillips-head, cadmium-plated steel, self-tapping screws. Characters shall be 3/16 inch high, unless otherwise indicated.

B. Markings:

- 1. Install identification markings to surface-mounted starters, switches, disconnect switches, contactors, and other devices controlling motors and appliances. Provide abbreviations required along with an identifying number. Markings to be provided with locking type stencils using paint of a contrasting color. Figures shall be 3/8 inch high unless otherwise indicated. Brady self-sticking plastic labels, with embossed characters made with a typewriter may be installed instead of stencils and paint; p-touch self-adhesive plastic, or Brother P-Touch self-sticking laminated

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plastic labels may be installed. Use phenolic type labels for exterior and interior application to suit environment conditions.

2. High Voltage: High voltage switchboards, cabinets, boxes, and conduits exposed in accessible locations, including under buildings and in attics, are required to be marked "WARNING-HIGH VOLTAGE – ABOVE 600 VOLTS". Markings for switchboards shall consist of 18 gage steel, porcelain enamel sign of standard manufacture. Markings for boxes, cabinets, and conduits shall be by means of stenciling or printed self-adhesive markers, Westline Tel-A-Pipe, or equal. Provide letters of black on orange background and not less than 1-7/8 inches high. On conduit runs, install markings at intervals not exceeding 10 feet in any individual area. Markings shall be installed after other painting Work is complete.

C. Warning Signs:

1. Provide a warning sign on outside of each door or gate to rooms or enclosures containing high voltage equipment. Signs required reading, "WARNING - HIGH VOLTAGE - KEEP OUT". Provide 2-inch high lettering.
2. Provide a warning sign on each high-voltage non-load break disconnect and fused cutout (not oil filled). Signs required reading, "DO NOT OPEN UNDER LOAD". Provide 2-inch-high lettering.
3. Provide signs of standard manufacture, 18 gage steel, with porcelain enamel finish. Provide red lettering on a white background.

PART 3 - EXECUTION

3.01 INSTALLATION AND SUPPORT OF BOXES

- A. Install outlet boxes flush with finished surface of wall or ceiling. Install plumb and securely fastened to structure, independent of conduit. Except where otherwise indicated, provide factory-fabricated adjustable attachment bar hangers between studs to support outlet boxes. When installation is performed in fire rated walls, maintain the wall's rating integrity by means of approved fire stop methods.
- B. Outlet boxes installed in suspended or furred ceilings with steel runner or furring channels shall be supported, except where otherwise indicated, by a Unistrut P-4000, Tessco A1200HS-10, or Cooper B-Line B22s-HG, or OWNER approved equal channel spanning main ceiling runner channels.
 1. Each box shall be supported from its channel by a 3/8-inch 16 threaded steel rod with a Unistrut P-4008, Fastenal #48604, Copper B-Line 78101140346 or OWNER approved equal; and nut and Tomic No. 711-B Adapta-Stud, or OWNER approved equal.

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2. Rod shall be tightened to a jamb fit with channel and its nut. Box shall be locked to rod by means of a 1/2-inch locknut on stud and a 3/8-inch 16 hex nut locking stud to rod.
- C. Heights of outlets and equipment indicated on Drawings shall govern. In absence of such indications, following heights shall be maintained with heights measured to centerline unless otherwise noted. Compliance with American with Disability Act is required. Coordinate with Architect and OWNER prior to installation.
1. Install wall-mounted switches at 48 inches above from top of box to finished floor.
 2. Outlet boxes for fire alarm pull stations shall be mounted at a mounting height above finished floor that ensures that the operating handle of the initiating device is no higher than 48 inches from finished floor.
 3. Wall mounted fire alarm strobe or horn/strobe devices shall be mounted such that the entire lens is not less than 80 inches above finished floor. If ceiling heights allow, wall mounted appliances shall have bottom of lens a minimum of 80 inches but not more than 96 inches to the top of lens.
 4. Install outdoor fire alarm audible devices or fire alarm sprinkler flow bells at least 10 feet but not more than 12 feet above finished floor to center. Provide STI or other OWNER approved protective covers as required in plans.
 5. Voice evacuation speakers mounted indoors shall be mounted in ceiling space or if mounted on wall shall not be less than 10 feet to center above finished floor.
 6. Install clocks and speakers, in classrooms and offices, 8 feet above finished floor. Unless otherwise indicated.
 7. In rooms other than places of assembly such as, but not limited to, multipurpose rooms, auditoriums, and libraries, clock outlets and speakers in classrooms and offices shall be mounted 8 feet above finished floors. Other assembly areas such as gymnasiums shall be mounted 10 to 12 feet above finished floor. Provide STI, or equal protective covers for clocks when required.
 8. Install fire alarm strobe lights 80 inches to bottom of light above finished floor.
 9. Install outside bells and yard light outlets 4 feet above second floor level for 2 or more story buildings, 12 inches below top plate level for one story buildings without covered porch or arcade, and 12 inches below covered porch and arcade ceilings.
 10. Install desk telephones, power receptacle outlets, and data outlets as indicated on drawings and as required for ADA compliance. Request clarification from the Engineer of Record prior to start of work whenever conflict is identified between ADA height requirements and drawings.
 11. Install panelboards and terminal cabinets 6 feet 6 inches from finish floor to top of cabinet.

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12. Install television outlets at a height corresponding to location of television monitor, or as indicated on plans.
13. The use of extension boxes shall be limited to not more than 1 times the original depth of junction box.

3.02 COVER PLATES

- A. Provide a plate on each switch, plug, pilot light, data, interphone, public telephone, and television outlet, and on existing and reset outlets where so indicated or required. Plates shall be of stainless steel unless otherwise specified. Student restroom receptacle cover shall be lockable type.
- B. Flush wiring device and signal system outlets indicated to be blank covered, shall be covered with blank stainless-steel plates. Flush lighting outlets to be blanked shall be covered with Wiremold 5736 steel covers, or equal, painted to match surrounding finish. Provide stainless steel covers to blank indicated or required surface-mounted outlets.
- C. In the following cases, and at required locations. Switch and receptacle plates shall be engraved with the device(s), or fixtures being controlled, or as indicated:
 1. Three-gang and larger gang switches in locations other than classrooms.
 2. Lock switches.
 3. Pilot switches.
 4. Switches so located that operator cannot see fixtures, or items of equipment controlled while his hand is on the switch.
 5. Switches not in same room with fixtures or items of unit heaters, air curtains, fly fans, etcetera.
 6. Receptacles operating at other than 120 V shall be identified with the operating voltage.
 7. Switches operating on 277 V shall be identified with the operating voltage.
 8. Where indicated on Drawings.
- D. Designations shall be as indicated on Drawings or as specified by Architect.

3.03 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

- A. Provide descriptive nameplates or tags permanently attached to switchboards, motor control centers, transformers, panelboards, circuit breakers, battery energy storage system equipment, PV system Inverters, disconnect switches, starters, pushbutton control stations and other apparatus installed for operation or control of circuits, appliances, fire alarm control panel(s), fire alarm annunciator(s), power supplies, terminal cabinets, energy management control units, and Information technology system backbone and distribution equipment points.

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- B. Provide nameplates of engraved laminated plastic, or etched metal. Submit Shop Drawings denoting dimensions and format to Architect before installation. Fasten to equipment with escutcheon pins, rivets, self-tapping screws, or machine screws. Self-adhering or adhesive backed nameplates are not permitted.
- C. Fasten tags to feeder wiring in conduits at every point where runs are broken or terminated, including pull wires in empty conduits. Indicate circuit number, panel, phase, and function. Tag branch circuits in panel boards and motor control centers. Tags may be manufactured of pressure-sensitive plastic or embossed self-attached stainless steel or brass ribbon. Underground pull box feeder labeling shall be made of material that is suitable for condition. (Bakelite, phenolic type)
- D. Provide circuit identification cards and cardholders in all panel boards. Cardholders shall consist of metal frame retaining a clear plastic cover permanently attached to inside of panel door. List of circuits shall be typewritten on a card. Circuit description shall include name or number of circuit's area and connected load.
- E. Junction and pull boxes shall have covers stenciled with box number when indicated on Drawings, or circuit numbers according to panel schedules. Data shall be lettered in a conspicuous manner with a color contrasting with finish.
- F. Name shall be correctly engraved, with a legend indicating function or areas, when required by codes or indicated on Drawings.

3.04 PROTECTION

- A. Protect Work of this section until Substantial Completion.

3.05 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

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SECTION 26 05 19 - LOW-VOLTAGE WIRES (1000 VOLT AC)

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes: Low-voltage wire, splices, terminations and installation.

1.02 RELATED REQUIREMENTS

- A. The installation of Low voltage wiring systems shall comply with the following building codes, regulations, and industry standards:
 - 1. Building Codes and Jurisdictional Requirements:
 - a. California Building Code (CBC).
 - b. California Electrical Code (CEC).
 - c. California Fire Code (CFC)
 - d. National Fire Protection Association (NFPA): NFPA-70 – National Electrical Code
 - e. NFPA-72 – National Fire Alarm and Signal Code.
 - f. Applicable California OSHA Standards.
 - g. City of Los Angeles Electrical Code.
 - h. City of Los Angeles Fire Code.
 - 2. Industry Standards:
 - a. TIA/EIA-607 – Grounding and bonding requirements for telecommunications.
 - b. ANSI/SIA Standards for alarms and access controls.
 - c. Underwriters Laboratories (UL): UL 444 – Safety Standards for Communication Cables.
 - d. UL 13 – Standard for Power Limited Circuit Cables.
 - 3. THWN/THHN wires shall comply with the following standards:
 - a. UL 83 for thermoplastic insulated wires.
 - b. UL 1063 for machine tool wires and cables.
 - c. UL 44 standard for thermoplastic-insulated, heat-resistant, non-metallic sheathed cable (Type RHH/RHW) for use in both wet and dry locations.

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- d. UL 3566 for copper-clad aluminum conductors for installations requiring high conductivity and flexibility.

1.03 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. List of Materials: Submit a complete list of proposed materials.
- C. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, insulation type, resistivity, conductivity, impedance, and conductance. Drawings shall contain sufficient information to assemble and install equipment at the Project site without further instructions.
- D. Prior to start of construction; provide letter from wiring and electrical cables manufacturer certifying that the products are qualified/ listed as low electromagnetic field products.

1.04 SUBSTITUTIONS

- A. Substitution requests shall comply with the contract general provisions stated in Division 01.
- B. When deviations are proposed the following information shall be submitted:
 - 1. Substitution request form that states the reasons and benefits to OWNER.
 - 2. Proposed substitutions requests shall provide proof of compliance with OWNER'S requirements and applicable standards.

1.05 QUALITY ASSURANCE

- A. Components and materials shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes.
- B. Wiring installation shall be performed under the supervision of state certified electricians. CONTRACTOR or Installer's electricians shall be certified in accordance with Labor Code sections 3099, and 3099.2 and section 209.0 of the California Code of Regulations.
- C. CONTRACTOR shall have adequate experience installing systems of similar size and complexity.
 - 1. Qualifications of Installer: Minimum five years of experience installing products and systems of similar scope and complexity.
 - 2. Installer shall have completed at least five projects of equivalent scope and complexity.

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- 3. CONTRACTOR shall have completed and commissioned a minimum of five service agreements that provide similar support services to those needed for this project.
- 4. System startup and testing shall be performed under direct observation of the Project Inspector and OAR.
- D. The Project Inspector will observe installation of feeder cables. Notify the Project Inspector not less than two working days in advance of the proposed time of feeder installation.

1.06 WARRANTY

- A. Provide a one-year labor warranty.
- B. Provide material warranty of no less than 10 years.
- C. Warranty period begins at substantial completion or project acceptance for beneficial occupancy.
- D. CONTRACTOR shall warranty all products and materials. Multiple warranty sources are not acceptable.

PART 2 - PRODUCTS

2.01 WIRES

- A. All wiring and feeders shall be Copper. Aluminum conductors are only allowed for vehicle charging stations per Specification Section 26 0520 Low Voltage Aluminum Feeders for Electric Vehicle Charging Stations.
- B. Pressure cable connectors shall be pre-insulated 3M Scotchlok, Ideal Wing Nut, O-Z/Gedney or equal.
- C. Wires shall be single conductor type THHN or THWN insulated with polyvinyl chloride and covered with a protective sheath of nylon, rated at 1000 volts. Wires may be operated at a maximum continuous conductor temperature in dry locations of 90 degrees C. and 75 degrees C. in wet locations. Wires and cables shall be listed by Underwriter's Laboratories (UL) Standard 83 for thermoplastic insulated wires and listed for installation in accordance with Article 310 of the California Electrical Code (CEC).
- D. Conductors shall be solid for 12 AWG and smaller conductors and stranded for 10 AWG and larger conductors.
- E. For Direct Current Fast Charging stations, the CONTRACTOR may opt for either aluminum or copper, depending on which material provides the most cost-effective solution. If Aluminum is used, the following applies:

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1. Provide Aluminum rated compression or cold-welded crimp connectors for termination of aluminum feeders to panels or service equipment. CONTRACTOR shall use a compression tool to crimp the Aluminum conductors into place.
 2. Use an approved Aluminum antioxidant compound to mitigate the risk of oxidation. Submit antioxidant compounds documentation to OWNER's OEHS department for review and approval.
 3. Heavy-duty mechanical lugs/connectors shall be used for terminating large Aluminum feeders at panels and service entrance.
 4. Twist-On connectors shall not be used unless specifically approved for Aluminum wiring and only if used with antioxidant compound for Aluminum branch circuit terminations.
- F. Conductors shall be insulated with PVC and sheathed with nylon.
- G. Wires shall be identified by surface markings indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Indentations for lettering are not permitted.
- H. Wires shall be tested in accordance with the requirements of UL standard for types THWN and THHN.
- I. Conductors shall be solid Class B or stranded Class C annealed uncoated in accordance with UL standards, or another Nationally Recognized Testing Laboratory (NRTL).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Wires shall not be installed until debris and moisture is removed from conduits, boxes, and cabinets. Wires stored at site shall be protected from physical damage until they are installed, and walls are completed.
- B. Wire-pulling compounds furnished as lubricants for installation of conductors in raceways shall be compounds approved and listed by UL, NRTL, or equal. Oil, grease, graphite, or similar substances are not permitted. Pulling of 2 AWG or larger conductors shall be performed with a cable pull machine. Any runs shorter than 50 feet are exempt. When pulling conductors, do not exceed manufacturer's recommended values
- C. At outlets for light, power, and signal equipment, pigtail splices with 8-inch circuit conductor leads for connection to fixtures, equipment, and devices.
- D. Pressure cable connectors, Yellow, Red, or Blue spring-loaded twist-on type, may be furnished in splicing number 8 AWG or smaller wires for wiring systems. Listed Push-in

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spring clamp wire connectors, Ideal In-Sure, or equal may be used in luminaires for fixture wiring.

- E. Joints, splices, and taps for wires No. 6 gage and larger shall be performed with high-pressure cable connectors approved for installation with copper conductors. Connectors shall be insulated with heavy wall heat shrink WCSM, or cold-applied roll-on sleeve RVS. Insulation level shall be a minimum of 1000V, and joints, splices, and taps shall be qualified to ANSI C 119.1, UL, NRTL, or equal listed mechanical pressure connections.
- F. Joints, splices, and taps for wires No. 6 gage and larger for Direct Current Fast Charging Stations shall be performed with high-pressure cable connectors approved for installation with aluminum conductors. Connectors shall be insulated with heavy wall heat shrink WCSM, or cold-applied roll-on sleeve RVS. Insulation level shall be a minimum of 1000V, and joints, splices, and taps shall be listed for use with Aluminum conductors.
- G. Connections to any bussing and high-press cable connectors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.
- H. Connection of any bonding or grounding conductors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.
- I. Wire switchboards, panel cabinets, pull boxes, and other cabinets except public address, shall be neatly grouped and tied in bundles with nylon ties at 10-inch intervals. In switchboards, panels and terminal blocks, wires shall be fanned out to terminals. If bundles are longer than 24 inches, a maximum of nine current carrying conductors may be bundled together.
- J. Install conductor lengths with a minimum length within the wiring space. Conductors must be long enough to reach the terminal location in a manner that avoids strain on the connecting lug.
- K. Maintain the conductor required bending radius.
- L. Neutral conductors larger than 6-gage, which are not color identified throughout their entire length, shall be taped, painted white or natural gray, or taped white where they appear in switchboards, cabinet, gutters or pull boxes. Neutral conductors 6 gage and smaller shall be white color identified throughout their entire length.
- M. Fire alarm and clock wiring shall be continuous from terminal cabinets or from equipment to each device. Splices are not permitted between devices and/or terminal cabinets at junction and pull boxes. Wiring shall be terminated at terminal blocks or devices only.
- N. Wiring systems shall be free from short circuits and grounds, other than required grounds. The CONTRACTOR shall be responsible for the testing of feeder and branch circuit conductor's insulation resistance. The insulation of the conductors shall be tested prior to connections to any panelboards, switchboards, variable frequency drives, lighting control

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systems, ballasts, and wiring devices such as but not limited to GFI receptacles, TVSS receptacles, or equipment. Insulation testing of panelboards and switchboards shall be independently performed from the insulation testing of any conductors as specified in other sections of this specification.

1. Utilize the services of an approved independent testing laboratory to perform megger time-resistance insulation testing of feeder conductors. Tests must be conducted with wires disconnected at both ends.
 - a. Provide calibration program records to assure the testing instrument to be within rated accuracy. The test equipment accuracy shall be in accord with the requirements stated by the National Institute of Standards and Technology (NIST).
 - b. Test equipment shall be provided with a label stating the date of last calibration. As a minimum the equipment shall have been calibrated within the past 12 months.
 - c. Test reports shall include the following:
 - 1) Identification of the testing organization.
 - 2) Equipment identification.
 - 3) Ambient conditions.
 - 4) Identification of the testing technician.
 - 5) Summary of project.
 - 6) Description of equipment being tested.
 - 7) Description of tests.
 - 8) Test results.
 - 9) Analysis, interpretation and recommendations.
2. Tests shall be performed in the presence of the Project Inspector.
3. Insulation resistance shall not be less than 100 mega-ohms.

3.02 COLOR CODES

A. General Wiring:

1. For phase and neutral conductors 6 gage or larger, permanent plastic-colored tape may be furnished to mark conductor end instead of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.
2. Color code conductor insulation as follows:

SYSTEM VOLTAGE		
Conductor	208Y/120	480Y/277
Phase A	Black	Brown
Phase B	Red	Orange

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Phase C	Blue	Yellow
Neutral	White	Natural Gray

Neutrals shall be colored-distinguished if circuits of two voltage systems are used in the same raceway.

- B. Signal Systems: Wires for signal systems shall be color-coded and installed under observation of the Project Inspector. Except where otherwise specified, color-coding shall be as follows:

EDIT NOTE: IN NEW SCHOOLS AND SOME EXISTING SCHOOLS THE PROGRAM SIGNAL IS THROUGH THE PA SYSTEM; IF PROGRAM BELLS ARE NOT PRESENT DELETE REFERENCE TO PROGRAM BELLS AS NEEDED.	
<u>SYSTEM</u>	<u>COLOR CODE</u>
Clocks	Pink, Gray and Orange
Program Bells (some existing elementary schools)	White (Common)Black
Initiating Devices (Non-Addressable)	Red (+) and Black (-)
Program Bells (some existing secondary schools)	White (120-volts, common) Black (C.R. program) Blue (Shop program) Brown (Gym program) Yellow (Auditorium fire alarm)
Fire Alarm Horns	Pink (+) and Gray (-)
Fire Alarm Strobes	Orange (+) and Blue (-)
Un-Interruptible 24 Volt Power (Annunciator, Water Flow, and Audible Device)	Yellow (+) and White (-) Note: A single white wire may be common to both
Interruptible 24 Volt Power (4 wire smoke detectors, duct detectors)	Brown (+) and White (-) Note: A single white wire may be common to both
Switch-Leg Sprinkler Bell (Between water flow and audible device)	Violet (+) and White (-)
Door Holding Magnets (Non-Power Limited)	Black (+) and White (-)

3.03 FEEDER IDENTIFICATION

- A. Feeder wires and cables shall be identified at each point the conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of heat shrink wire markers, which provide terminal strain relief. Markers shall be by Tyco Electronics, Panduit, Brady Perma-Sleeve, or equal. Identification in other areas shall

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be by means of wrap-around tape markers from Tyco Electronics, Panduit, Brady Perma-Code or equal. Markers shall include feeder designation, size, and description.

3.04 TAPE AND SPLICE KITS

- A. Splices, joints, and connectors joining conductors in dry and wet locations shall be covered with insulation equivalent to that provided on conductors. Free ends of conductors connected to energized sources shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL, NRTL, or equal for installation as sole insulation of splices shall be furnished and shall be installed according to manufacturer's printed specifications.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide and install an effective grounding and bonding system.
- B. Related Requirements:
 - 1. Refer to related sections for their system grounding requirements.
 - 2. Division 01 - General Requirements.
 - 3. Division 26 – Electrical.
 - 4. Division 27 – Communications.

1.02 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. IEEE 142 Green Book.
 - 2. Underwriter's Laboratories (UL).
 - 3. California Electrical Code.
 - 4. Building Industry Consultant Services International (BICSI).
 - 5. EIA/TIA (Signal and power).
 - 6. Nationally Recognized Testing Laboratory (NRTL).

1.03 SYSTEM DESCRIPTIONS

- A. Equipment, components, or materials that enclose electrical conductors, or are likely to be energized by electrical currents shall be effectively grounded.
- B. Metal equipment parts such as switchboards, panelboards, metal enclosures, raceways, equipment grounding conductors, and earth grounding electrodes shall be effectively bonded into a continuous grounding path.
- C. Metallic systems or electrically conductive materials shall be effectively bonded to the building's grounding electrode system.
- D. A separately derived AC system shall be grounded to the equipment grounding conductor and to a separate "made" electrode of building grounding electrode system.

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- E. Provide effective electrical equipment bond continuity to all metal raceways and enclosures. Grounding shall be achieved through a code sized green insulated grounding conductor provided within each raceway.
1. Each flexible conduit over six feet in length shall be provided with a green insulated grounding conductor of required size.
 2. Provide code sized equipment grounding conductor in all flexible conduits as required by CEC.
 3. The length of flexible conduit installations shall not be less than six feet.
 4. Effectively ground metal raceways and enclosures at each end.
- F. Cold water, or other utility piping systems, shall not be utilized as grounding electrodes. In addition to bonding to cold water pipe provide at least one of the following made grounding electrodes:
1. Provide a dedicated “made” electrode for new buildings and existing facilities service upgrades. The made electrode shall be fabricated of at least 20 feet of uncoated galvanized 1/2 inch diameter rebar encased by at least two inches of concrete, and placed next to the bottom of a concrete foundation, or footing in direct contact with earth. A welded extended portion shall surface at the location of the common grounding electrode bus bar and be extended by a 3/0 exothermic welded bare copper cable, or be welded directly to the bus. The exothermic weld shall be at least four inches above finished floor in a dry location. The main grounding electrode and associated grounding conductors shall be in an enclosure and in conduit.
 2. The concrete enclosed electrode shall be fabricated of at least 20 feet of code sized bare copper conductor. The electrode conductor shall never be smaller than No. 2 AWG. Electrode shall be encased by at least two inches of concrete, located within or near bottom of a concrete foundation, or footing in direct contact with earth. Footing rebar shall be connected to electrode conductor with approved connectors.
 3. An external grounding electrode, as specified hereafter or as required by the CEC shall be installed and connected to foundation or footing rebar.
- G. Non-current carrying metal parts of equipment enclosures, signal and power conduits, switchboard and panelboard enclosures, motor frames, equipment cabinets, and metal frames of buildings shall be permanently and effectively bonded to the grounding system. Provide a CEC sized equipment grounding conductor in every raceway.
- H. Metallic or semi-conducting shields and lead sheaths of cables operating above 1000 Volts shall be permanently and effectively grounded at each splice and termination.
- I. Neutral of service conductors shall be grounded as follows:
1. Neutral shall be solidly grounded at only one point within the Project site for that particular service. Preferable location of grounding point shall be at the service switchboard, or main switch.

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2. Equipment and conduit grounding conductors shall be bonded to that grounding point.
 3. If other buildings or structures on the Project site are served from a switchboard or panelboard in another building, power supply is classified as a feeder and not as a service.
 4. Equipment grounding conductor shall be installed from switchboard to each individual building. At building, grounding conductor shall be bonded with power equipment enclosures, metal frames of building, etc., to “made” electrode for that building.
 5. Feeder neutrals shall be bonded at service entrance point only; neutrals of separately derived systems shall be bonded at the source only.
- J. If there is a distribution transformer at a building the secondary neutral conductor shall be grounded to “made” electrode serving the building.
- K. Within every building, the main switchboard or panelboard, shall be bonded to the cold-water line. Metallic piping systems such as gas, fire sprinkler, or other systems shall be bonded to the cold-water line.

1.04 SUBMITTALS

- A. Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Furnished yard boxes shall be precast concrete and shall be approximately 14 inches wide by 19 inches long by 12 inches deep or larger.
1. Boxes shall be furnished with bolt-down, checkered, cast iron covers and cast-iron frames cast into the yard boxes.
 2. Yard boxes shall comply with LAUSD standard detail E-102.
 3. Provide yard boxes with hinged Frame Locking Cover.
 4. Approved products include Brooks No. 36 HFL, Jensen Precast, Oldcastle Precast, Western Precast, Kistner, or equal.
- B. External ground electrodes shall be copper-clad steel ground rods, minimum 3/4-inch diameter by ten feet long.
- C. Clamps and fittings used in ground boxes below grade shall be listed for direct burial.

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PART 3 - EXECUTION

3.01 INSTALLATION

- A. Grounding electrodes shall be installed in the nearest suitable planting area, where not otherwise indicated on Drawings, and each electrode shall terminate within a concrete yard box installed flush with finish grade. In planting areas, finish elevation of concrete yard boxes shall be two inches above planting surfaces.
- B. If concrete enclosed electrode is provided, grounding wire shall be terminated to a suitable copper plate with grounding lugs and must be enclosed in a raceway or box.
- C. Grounding rods shall be driven to a depth of not less than eight feet. Permanent ground enhancement material, (GEM) as manufactured by Erico Electrical Products, Loresco Powerset, Tessco Ultrafil or equal, shall be installed at each ground rod to improve grounding effectiveness. Install in accordance with manufacture's installation instructions.
- D. Grounding electrodes shall provide a resistance to ground of not more than 25 ohms.
- E. When installing grounding rods, if resistance to ground exceeds 25 ohms, two or more rods connected in parallel, or coupled together shall be provided to meet CEC grounding resistance requirements.
- F. Ground rods shall be separated from one another by not less than ten feet.
- G. Parallel grounding rods shall be bonded together with listed fittings and grounding conductors in galvanized rigid steel conduit, buried not less than 12 inches below finish grade.

3.02 TESTING

- A. Provide the services of an approved independent testing laboratory to test grounding resistance of "made" electrodes, ground rods, bonding of building steel, water pipes, gas pipes and other utility piping. Tests shall be performed as follows:
 - 1. Visually and mechanically examine ground system connections for completeness and adequacy.
 - 2. Perform fall of potential tests on each ground rod or ground electrode where suitable locations are available per IEEE Standard No. 81, Section 8.2.1.2. Where suitable locations are not available, measurements will be referenced to a known dead earth or reference ground.
 - 3. Perform the two-point method test per IEEE No. 81, Section 8.2.1.1 to determine ground resistance between ground rod and building steel, and utility piping - such

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as water, gas and panelboard grounds. Metal hand railings at building entrances and at handicapped ramps shall also be tested.

4. Test shall be performed in the presence of the Inspector.
- B. Submit 3 copies of test results to the Architect. Test results shall be submitted on an official form from the independent testing laboratory recording Project location, test engineer, test conditions, test equipment data, ground system layout or diagram, and final test results.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 26 05 33 - RACEWAYS, BOXES, FITTINGS, AND SUPPORTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Raceways and wire ways.
2. Conduit installation.
3. Underground requirements.

B. Related Requirements:

1. Section 26 0500: Common Work Results for Electrical.
2. Section 26 0513: Basic Electrical Materials and Methods.
3. Division 27: Communications.

C. Applicable Standards and Codes.

1. EIA/TIA 569 Standards.
2. National American Standards Institute (ANSI).
3. National Electrical Manufacturer's Association (NEMA).
4. Nationally Recognized Testing Laboratory (NRTL).
5. California Electrical Code (CEC).
6. Uniform Building Code (UBC).
7. Underwriters Laboratory (UL).

1.02 SUBMITTALS

A. Materials List: Provide in accordance with Division 01.

B. List of Materials: Submit a complete list of proposed materials.

C. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, method of fitting and fastening parts together.

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1.03 SUBSTITUTIONS

- A. When deviating or substituting materials and products, the following information shall be submitted:
1. Comply with requirements indicated in Division 1, Specification Section 01 2513 - Product Procedures for Substitutions and Or Equal.
 2. Provide substantiating evidence of benefits and pros and cons of the proposed material/components.

PART 2 - PRODUCTS

2.01 RACEWAYS

- A. Conduit Materials:
1. Metallic conduit, and tubing shall be manufactured under the supervision of an UL, or another NRTL factory inspection and label service program. Each ten-foot length of conduit and tubing shall bear the UL or another NRTL label and manufacturer's name.
 2. Rigid metallic conduit shall be rigid steel, heavy wall, mild steel, zinc-coated, with an inside and outside protective coating manufactured in accordance with ANSI C 80.1. Couplings, elbows, bends, conduits, bushings and other fittings shall be the same materials and finish as the rigid metallic conduit. Fittings, connectors, and couplings shall be threaded type, manufactured in accordance with ANSI C 80.1 and UL 6.
 3. Electrical metallic tubing shall be steel tubing, zinc-coated with a protective enamel coating inside, manufactured in accordance with NEMA C 80.3. Fittings, couplings, and connectors shall be gland compression type, set screw couplings and connectors not permitted. All parts shall be manufactured in accordance with NEMA C80.3 and UL 797 Electrical metallic tubing is designated hereinafter as EMT. Steel and rain tight fittings shall be approved and listed for the intended application.
 4. Flexible steel conduit shall be of flexible interlocking strip construction with continuous zinc coating on strips, manufactured in accordance with UL 1.
 - a. Connectors and couplings shall be required fittings of the type, which threads into convolutions of flexible conduit.
 5. Liquid-tight flexible metal conduit shall be galvanized heavy wall, flexible locked steel strip construction, UV rated, with smooth moisture and oil-proof, abrasion-resistant, extruded plastic jacket. Connectors shall be as required for installation with liquid-tight flexible conduit and shall be installed to provide a liquid-tight connection.

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6. Non-metallic conduit shall be rigid PVC electrical conduit extruded to schedule 40 dimensions of Type II. Grade 1 high impact, polyvinyl chloride, sweeps, couplings, reducers and terminating fittings shall be listed under the UL, or another NRTL, and shall bear the manufacturer's listed marking.
 7. Multi-cell raceway shall be four-inch PVC, Type 40, UL or another NRTL listed for underground use with optical fiber and signal system cables. Raceway shall be furnished with (3)1¼ inch factory installed inner ducts with required internal spacers, and required couplers, sweeps, and end bells. Multicell raceway shall be Carlon Multigard, or District approved equal.
 8. Metal Clad (MC) cable system is not allowed.
- B. Sleeves for Conduits: Sleeves shall be adjustable type by Carlon, U.S. Plastic, Arlington or equal.
- C. Where conduit enters a building through a concrete foundation below grade, or ground water level, or where it is necessary to seal around a conduit where it passes through a concrete floor or wall, provide O-Z/Gedney Type FSK Thru Wall and Floor Seal, equivalent Eaton Crouse Hinds Thru-Wall, Legrand Thru-Wall, or equal.
- D. Expansion Joints-Seismic Separations between building(s) and other locations as indicated on drawings:
1. Provide Thomas & Betts XJG-TB, O-Z/Gedney. type AX with bonding strap and clamps, Eaton XJGD or equal. At exterior locations, provide Thomas & Betts XJG-TB, O-Z/Gedney type EX, Eaton XJGD, or equal. Provide O-Z/Gedney type AXDX, or equal combination deflection/expansion fittings at all seismic separations. Provide manufacture's internal and external bonding jumpers at all locations. Liquid-tight metal conduit or flexible metal conduit shall not be approved at expansion joints, separations between buildings or seismic separations.
 2. Provide expansion fittings at intervals not exceeding 100 feet in conduits exposed to direct sunlight. Fittings may be installed in the conduit run or where conduit attaches to junction or pull boxes. OZ/Gedney type AX, DX or AXDX combination series, or equivalent by Thomas and Betts, Crouse-Hinds or approved equal.
- E. Conduit Seal Fittings:
1. Provide conduit seal fittings where indicated on the Drawings. Conduit seals shall be of rigid galvanized steel. Seals in horizontal conduit installations shall be Thomas & Betts EYS, Appleton Type ESU, Crouse Hinds Type EYS, or equal. Seals in vertical conduit installations shall be Thomas & Betts EYD, Appleton Type SF, Crouse Hinds Type EYD, or equal, with continuous drain. When installing conduit seals make provision for percent fill space reduction in accordance with CEC.
 2. Install sealing compound after wire has been installed. Ensure drain is not blocked in vertical seals when installing compound. Where conduit seals are installed in hazardous area applications, there shall be no conduit coupling, fitting, etc., between seal and boundary of hazardous area.

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F. Surface Steel Raceway:

1. The surface steel raceway system for branch circuit wiring, data network, voice, video, and other low voltage wiring shall be as manufactured by the Wiremold Company, Hubbell, or Mono-Systems, Inc. or equal. The raceway system may be supplied pre-wired in accordance with all sections of these specifications and requirements herein and shall be UL or another NRTL listed. Computer data installation shall be as required by other sections of this Division.
 - a. If furnished pre-wired, the system must be listed in accordance with UL or another NRTL for "Multiple Outlet Assemblies" and so labeled on interior of the assembly. The pre-wired installation must contain no extra wire splices in the raceway as compared to a CONTRACTOR assembled installation assembled from components. The pre-wired steel raceway shall be Hi-Pot tested at the factory to prevent any potential bare wire or short circuit defects.
2. The raceway base, cover, and device bracket shall be manufactured of steel and finished in ivory, gray enamel or custom colors suitable for field painting to match adjacent finishes.
3. The raceway shall be a two-piece design with a metal base and snap-on metal cover, except for the Wiremold V700 system, Hubbell HBL750 series and Mono-Systems Inc. S145-700 series that shall be a one-piece design. The base and cover sections shall be a minimum of 0.040-inch wall thickness. The base section shall be available in ten-foot lengths. A hand-operated cutting tool shall be available for the base and cover to ensure clean, square cuts. Wiremold V500, Hubbell V500, and Mono Systems inc. SM500 series are not permitted.
4. A full complement of fittings shall be furnished, including but not limited to, flat internal and external elbows, tees, entrance fittings, wire clips, cover clips, couplings, support clips, C-hangers and end caps. The fitting color shall match the raceway color. Fittings shall be supplied with a base where indicated and/or required. A take-off fitting shall be furnished as required to adapt to existing flush wall boxes.
5. Device brackets shall be furnished for mounting single or two-gang devices within the raceway. Devices shall be provided with the ability of mounting flush or in conjunction with standard steel, stainless steel, or manufacturer's metal faceplates.
6. The raceway shall be furnished with a complete line of connectivity outlets and modular inserts for unshielded twisted pair including category 5, fiber-optic, coaxial, and other cabling types with face plates and bezels to facilitate installation. Computer data installation shall be as required by other sections of this Division, and Division 27.
7. Raceway shall be furnished with corner elbows and tee fittings to maintain a cable bend radius which meets the requirements of fiber-optic and copper cables under EIA/TIA 569 for communications pathways.

G. Factory Pre-Wired Surface Metal Raceway:

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1. Furnish and install pre-wired surface metal raceways as indicated on Drawings and as specified.
 2. Metal Raceway shall be galvanized steel Wiremold V4000, Hubbell 4000 series, or Mono-Systems Inc. SMS-4000 series complete with raceway base, cover, fittings, receptacles and mounting plates required for a complete assembly. Raceway shall have two wiring compartments with integral dividing barrier for isolating the wiring compartments.
 3. Pre-wired assembly shall be UL, or another NRTL listed as a multi-outlet assembly and surface raceway as labeled on interior of assembly.
 4. Wiring devices and other components shall be factory installed, electrically wired and covers labeled as indicated on drawings. Each receptacle shall be identified with panelboard and circuit number from which it was fed. Grounding shall be maintained by means of factory installed grounding conductors.
 5. Where shown on Drawings, Raceway covers shall have provisions for mounting computer data outlets.
 6. Complete assembly is to consist of required fittings such as elbows, slide couplings for joining raceway sections, blank end caps and flat tees.
 7. Prewired assembly must contain no wire splices.
 8. Receptacles and wiring shall be as indicated on drawings and as specified.
 9. Where raceway is used for power and computer data outlets, installation of data outlets shall be as required by other sections of this specification.
 10. Prior and during installation, verify and comply with manufacturer's installation instructions.
 11. Entire assembly shall be tested for shorts, opens, ground faults, and wire insulation at factory and certified. Raceways shall be electrically continuous and bonded in accordance with California Electrical Code.
 12. Submit shop drawings for approval showing the complete layout of all components of each raceway, raceway lengths, each component description, location and circuit identification.
 13. All wiring devices shall be removable without requiring disassembly of wireway.
- H. Wireways shall be 16 gage galvanized steel enclosed hinge/screw wiring troughs, surface metal raceway, wireway, and auxiliary gutter designed to enclose electrical wiring. Wireway fittings shall be furnished with removable covers and sides to permit complete installation of conductors throughout the entire wireway run. Cover shall be furnished with keyhole slots to accept captive screws locking the cover securely closed. Wireways shall be UL or another NRTL listed and shall be Square D Type LDB NEMA-1 enclosure for interior applications, or Type RDB NEMA-3R enclosure for exterior applications, or equal by Eaton B-line, Hoffman, Wire Guard, or Circle AW.
- I. Penetration in Fire-Rated Structures: Provide 3M, or equal, sealant and fire barriers for installing fire-rated seals around penetrations through floors, walls, and elevator

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hoistways. Fire stop system must be UL, or another NRTL listed, and classified for through-penetration applications of metallic conduits and busways.

- J. Pull Wires: Install 1/8-inch polypropylene cords in empty or spare conduits.

PART 3 - EXECUTION

3.01 CONDUIT INSTALLATION

A. General Requirements:

1. Provide complete and continuous systems of rigid metallic conduit, outlet boxes, junction boxes, fittings and cabinets for systems of electrical wiring including lighting, power, and signal systems, except as otherwise specified.
2. EMT may be installed in interior concealed applications and in areas approved by OWNER. EMT shall not be installed in concrete, directly buried underground, outdoors, in boiler rooms, elevator pits, or where subject to damage.
3. Within buildings, flexible steel conduit may be installed instead of rigid steel conduit where permitted by code and as indicated herein.
 - a. Concealed within frame walls, above hard lid ceilings, for drops to device outlets and light fixtures in suspended T-bar ceilings and for final connections to equipment only
 - b. For continuous lengths of up to 50 feet between pull points (pull boxes, outlet boxes, etcetera).
 - c. Where used for luminaires in accessible ceilings, it shall be neatly trimmed to proper length and avoid unnecessary bends.
 - d. Suspended flexible steel conduit drops for light fixtures and device outlet boxes in suspended ceilings shall not exceed 6 feet.
 - e. Flexible steel conduit is not allowed in other locations
 - f. Flexible Steel conduit shall not exceed 1-1/2 inches in size.
4. Liquid-tight flexible steel conduit shall only be installed, except where otherwise specified, for final connection of motor terminal boxes, shop equipment, cafeteria equipment, HVAC equipment and other equipment, or for frequent interchange, and shall be of sufficient length, not exceeding 36 inches, to permit full travel or adjustment of motor on its base. Liquid-tight flexible conduit shall not be used for equipment not requiring adjustment or frequent interchange.
5. Connectors for flexible metal conduit shall be made of diecast zinc, and of the types which threads into convolutions of conduit. Connectors for watertight flexible metal conduit shall be as required for installation and shall be installed to provide a watertight connection.
6. Exposed conduit shall be installed vertically and horizontally following the general

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configuration of the equipment, using cast threaded hub conduit fittings where required and shall be clamped to equipment with suitable iron brackets and one-hole pipe strap.

7. If connection is from a flush wall-mounted junction box, install an approved extension box.
8. Underground feeder distribution conduits for systems may be non-metallic conduit instead of rigid conduit except where otherwise specified or indicated.
9. Conduit shall be concealed unless otherwise indicated. Conduits exposed to view, except those in attic spaces and under buildings, shall be installed parallel or at right angles to structural members, walls, or lines of building. Conduits shall be installed to clear access openings.
10. Bends or offsets will not be permitted unless absolutely necessary. Radius of each conduit bend or offset shall be as required by ordinance. Bends and offsets shall be performed with standard industry tools and equipment or may be factory fabricated bends or elbows complying with requirements for radius of bend specified. Heating of metallic conduit to facilitate bending is not permitted. Public telephone conduit bends and offsets shall be provided with a radius which is not less than ten times trade size of conduit unless otherwise permitted. Refer to underground installation, specified in this section, for radius of bends and offsets required for underground installations.
11. Running threads are not permitted. Provide conduit unions where union joints are necessary. Conduit shall be maintained at least six inches from covering of hot water and steam pipes and 18 inches from flues and breechings. Open ends of conduits shall be sealed with permitted conduit seals during construction of buildings and during installation of underground systems.
12. Expansion Joints/Seismic Separations/Separations between buildings/Locations Indicated: Provide Thomas & Betts XJG-TB, O-Z Electrical Mfg. Co. Inc. Type AX with bonding strap and clamps. Crouse Hinds XJGD, or equal. At exterior locations, provide Thomas & Betts XJG-TB, O-Z Electrical Mfg. Co. Inc. Type EX, Crouse Hinds XJGD, or equal. Provide Crouse Hinds, Thomas & Betts, or O-Z Electrical Mfg. Co. Type AXDX, or equal Combination Deflection/Expansion Fittings at all seismic separations. Provide manufactures internal and external Bonding Jumpers at all locations. Liquid-tight flexible conduit shall not be approved at expansion joints or seismic separations.
13. Where conduits are terminated in groups at panelboards, switchboards, and signal cabinets, etc., provide templates or spacers to fasten conduits in proper position and to preserve alignment. Conduits terminating at signal cabinets shall only enter cabinets in the following locations:
 - a. Conduits entering top, side, and bottom of cabinets shall be aligned in a single row, centered two inches from rear of cabinet.
 - b. Conduits entering back of cabinet shall be aligned in a single row centered two inches from top of cabinet.
 - c. Conduits shall not be spaced closer than three inches on centers.

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14. Conduits above metal lath ceilings shall be rigidly suspended with pipe hangers or pipe racks or shall be secured to superstructure with factory fabricated pipe straps. Conduits in metal lath or steel stud partitions shall be tied to furring channels or studs. In ceiling spaces and in partitions, tie wires shall be spaced not more than 5 feet apart, shall fasten conduit tight against channels and studs at point of tie and shall not support any of conduit weight. Tie wire shall be 16 gage galvanized double annealed steel.
15. Where auxiliary supports, saddles, brackets, etc., are required to meet special conditions, they shall be fastened rigid and secure before conduit is attached.
16. Conduit in ceiling spaces, stud walls, and under floors, shall be supported with factory fabricated pipe straps or shall be suspended with pipe hangers or pipe racks. Pipe straps shall be attached to and shall fasten conduit tight at point of support against ceiling and floor joists, rafters, and wall studs, or two-inch x four-inch headers fitted between joists or wall studs.
17. Conduits installed on exposed steel trusses and rafters shall be fastened with factory fabricated conduit straps or clamps, which shall fasten conduit tight against supporting member at point of support.
18. Conduits installed under buildings shall be strapped with factory fabricated conduit straps to underside of concrete floor or joists, or wood floor joists, or shall be suspended with pipe hangers or pipe racks. Conduits under building are not permitted to be placed directly on grade; they shall be suspended from building or shall be buried below surface or ground. 1-1/4 inch and larger conduits under buildings shall be installed with conduit hangers or racks.
19. Pipe hangers for individual conduits shall be factory fabricated. Steel rods shall be 3/8 inch for two-inch conduit hangers and smaller and shall be 1/2 inch for 2 1/2-inch conduit hangers and larger.
20. Pipe racks for groups of parallel conduits and for supporting total weights not exceeding 500 pounds shall be trapeze type and shall consist of a cross channel, Steel City Kindorf B-900, Unistrut P-1000, equivalent Eaton B-Line or equal, suspended with a 3/8 inch minimum diameter steel rod at each end. Rods shall be fastened with nuts, top and bottom to cross-channel and with square washers on top of channel. Conduits shall be clamped to top for cross-channel with conduit clamps, Steel City Kindorf C-105 or Unistrut P-1111 through P-1124, equivalent Eaton B-Line, or equal. Conduits shall not be stacked one on top of another, but a maximum of two tiers may be on same rack providing an additional cross-channel is installed. Where a pipe rack is to be longer than 24 inches, or if the supported weight exceeds 500 pounds, submit Shop Drawings of installation to the ARCHITECT for review.
21. Conduits suspended on rods more than two feet long shall be rigidly braced to prevent horizontal motion or swaying. Installation shall meet zone 4 seismic requirements.
22. Factory fabricated pipe straps shall be one or two-hole formed galvanized clamps, heavy-duty type, except where otherwise specified.

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23. Hangers, straps, rods, or pipe supports under concrete shall be attached to inserts set at time concrete is placed, or with approved concrete anchors. Under wood, install bolts, lag bolts, or lag screws; under steel joists or trusses, install beam clamps. CONTRACTOR shall submit size of anchors, bolts, screws, and installation method to ARCHITECT for approval prior to start of any work.
24. Conduits shall be supported at intervals required by code, but not to exceed ten feet. One inch and smaller exposed conduits shall be fastened with one-hole malleable iron straps. Perforated straps and plumber's tape is not permitted for the support of conduits.
25. Conduits stubbed up through a roof or an arcade shall be flashed with a waterproof flashing. Refer to Division 07 for additional requirements.
26. Bushings and locknuts for rigid steel conduit shall be steel threaded insulating type. Setscrew bushings are not permitted.
27. Flex conduits shall be cut square and not at an angle.
28. Routing of conduits may be changed providing length of any conduit run is not increased more than ten percent of the length indicated on Drawings.

B. Underground Requirements:

1. Conduits and multicell raceways installed underground shall be entirely encased in three-inch-thick concrete on all sides, except where otherwise specified. Provide required spacers to prevent any deflection when concrete is placed and to preserve position and alignment. Spacers shall be PVC interlocking-type, intermediate and base styles, Carlon or approved equal. Conduits and raceways shall be tied to spacers. Anchors shall be installed to prevent floating of conduits and raceways during placing of concrete. If approved by Civil or Structural Engineer, UL Listed HDPE spacers may be used in concrete encased duct banks where holes are provided for continuous concrete to flow. Provide red colored concrete to encase conduits of systems operating above 1000 volts.
2. Underground conduits and raceways shall be buried to a depth of not less than 24 inches below finished grade to top of the concrete envelope, unless otherwise specified.
3. Assemble sections of conduit with required fittings. Cut ends of conduit shall be reamed to remove rough edges. Joints in conduits shall be liquid tight. Bends at risers shall be completely below surface where possible.
4. Conduits and raceways in a common trench shall be separated by at least three inches of concrete. Electrical power and/or lighting conduit runs installed in a common trench with conduits containing signal system wiring such as public address, telephone, intrusion detection, fire alarm, television, computer networking, and clock systems shall maintain a separation of a minimum of six inches from these types of signal system conduits and raceways. Electrical power, lighting and signal conduits and raceways installed in a common trench with other utility lines such as gas, water, sewer and storm lines shall maintain 12 inches separation from these types of utility lines.

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5. The Inspector will observe underground installations before and during concrete placement. A mandrel shall be drawn through each run of conduit in presence of the Inspector before and after placing concrete. Mandrel shall be six inches in length minimum and have a diameter that is within 1/4 inches of diameter of conduit to be tested.
 6. Non-metallic conduit installations shall comply with following additional requirements. Joints in PVC conduit shall be sealed by means of an OEHS approved solvent-weld cement supplied by conduit manufacturer. Non-metallic conduit bends and deflections shall comply with requirements of applicable electrical code, except that minimum radius of any bend or offset for conduits sized from 1/2 inch to 1 1/2-inch inclusive shall not be less than 24 inches. Bends at risers and risers shall be PVC-coated rigid steel conduit. Radius of curve of bends or offsets in non-metallic conduit for public telephone system shall be not less than ten times trade size of conduit, unless otherwise specifically permitted.
 7. Furnish and install a six-inch wide, polyethylene, red underground barrier type 12 inches above full length of concrete reading, "CAUTION ELECTRIC LINE BURIED BELOW".
 8. Underground conduit systems provided for utility companies shall be furnished to meet the requirements of the utility companies requiring service.
 9. Protect inside of conduit and raceway from dirt and rubbish during construction by capping openings.
 10. Add bell-end bushings for conduit stub-up including underground entries to pull boxes, and manholes. Under floor standing switchboards and motor control centers provide a four-inch galvanized nipple with ground bushing.
 11. Underground conduit for systems operating above 600 volts shall be a minimum size of four inches.
 12. At portable classroom all stub ups shall be installed with a coupling flush to finish grade.
 13. Underground conduits and raceways shall be swabbed prior to wire pull.
- C. Rooftop conduit shall be supported from channels, stands, clamps, trapezes, rollers, or structures mounted on 100% rubber, UV resistant rooftop supports with reflective strips, Dura-Blok, or equal. Roller type supports shall be provided below and above conduit to prevent its dislodgement. Bottom of conduits shall clear the roof surface by 10 inches.
1. At PVC roofing provide walk tread, polyester reinforced, UV resistant, with surface embossment at rooftop supports. Heat welding of walk pads shall only be done by manufacturer certified installers.
 - a. Sika-Sarnafil and Carlisle: Walk tread shall be no more than one inch larger than the plan area of the pipe support blocks and adhered to the roof membrane with Sika 1A or Carlisle Universal Single-Ply sealant, as applicable.
 - b. Johns Manville: Walk tread shall be installed under the pipe support

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blocks and adhered to the blocks, if possible, and left loose laid on top of the PVC roof system. Walk-pad shall have a minimum of 4 inches of material past perimeter on all 4 sides of block.

2. Built-up roofing: Provide APP granulated modified torch-down at each pipe support block. Torch-down shall extend 2 to 4 inches beyond the edges of the block and adhered by torch application over existing cap sheet membrane. This work shall be performed by a certified roofer.

D. General Installation Requirements for Computer Network System Conduits:

1. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Drawings shall not be scaled to determine position and routing of wireways, drops, and outlet boxes. Location of outlet boxes and equipment shall conform to architectural features of the building and other Work already in place and must be ascertained in the field before start of Work.
2. The maximum pulling tensions of the specified cables shall not be exceeded, and proper radius of cable bends shall be maintained.
3. For computer network wiring, conduit types shall be limited to rigid metal conduit, electrical metallic tubing, schedule 40 PVC, multi-cell raceways, and flexible metallic conduit for lengths less than six feet.
4. Interior section of conduit run shall be not longer than 100 feet and shall not contain more than two bends of 90 degrees between pull points or pull boxes.
5. The inside radius of a conduit bend shall be at least six times the internal diameter of the conduit. When the conduit size is greater than two inches, the inside radius shall be at least ten times the internal diameter of the conduit. For fiber-optic cable, the inside radius of a conduit bend shall be at least ten times the internal diameter of the conduit.
6. Conduit shall be sized in accordance with Table 4.4-1 of EIA/ TIA 569 standard.
7. Splicing or terminating cables in pull boxes is not permitted.
8. For indoor application, a pull box shall be provided in conduit run where:
 - a. The length is over 100 feet.
 - b. There are more than two bends of 90 degrees.
 - c. There is a reverse bend in the run.
9. Boxes shall be provided in a straight section of conduit and shall not be installed in lieu of a bend. The corresponding conduit ends are to be aligned with each other. Conduit fittings shall not be installed in place of pull boxes.
10. Where a pull box is provided with raceways, pull box shall comply with the following:
 - a. For straight pull-through, provide a length of at least eight times the trade-size diameter of the largest raceway.
 - b. For angle and U-pulls:

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- 1) Provide a distance between each raceway entry inside the box and the opposite wall of the box of at least six times the trade-size diameter of the largest raceway, this distance being increased by the sum of the trade-size diameters of the other raceways on the same wall of the box.
 - 2) Provide a distance between the nearest edges of each raceway entry enclosing the same conductor of at least:
 - 3) Six times the trade-size diameter of the raceway; or
 - 4) Six times the trade-size diameter of the larger raceway if they are of different size.
 - 5) For a raceway entering the wall of a pull box opposite to a removable cover, provide a distance from the wall to the cover of not less than the trade-size diameter of the largest raceway plus six times the diameter of the largest conductor.
11. Drawings generally indicate Work to be installed, but do not indicate all bends, transitions of special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits and wireways are to be installed and furnish and install required fittings.

E. Slabs on Grade:

1. Unless specifically reviewed by the ARCHITECT and DSA, conduits 1 ¼-inches and larger are not permitted to be installed in structural concrete slabs. Where conduits are permitted, and are installed in concrete slabs on grade, slabs shall be thickened at bottom where conduits occur to provide three inches of concrete between conduit and earth. Required excavation shall be part of the Work of this section.
2. If concrete slab is five inches or more in thickness with a moisture barrier plastic sheet between earth and slab, one inch and smaller conduits shall be installed in the slab with a minimum of one-inch concrete between earth and conduit.

F. Concrete Walls, Beams, and Floors: Provide sleeves where conduits pierce concrete walls, beams, and floors, except floor slabs on grade. Sleeves shall provide 1/2-inch clearance around conduits. Sleeves shall not extend beyond exposed surfaces of concrete and shall be securely fastened to forms. Where conduits pass through walls below grade, seal with required sealant and backer materials between conduit and sleeve to provide a watertight joint. Sealant shall be as indicated in Section 07 9200: Joint Sealants.

3.02 STUBS

- A. Panelboard: Install two one-inch conduits from each flush mounted panelboard to access under floor space and to access above ceiling space where these conditions occur. Cap conduits with standard galvanized pipe caps.

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- B. Floor: At points where floor stubs are indicated in open floor areas, for connections to machines and equipment, conduits shall be terminated with couplings, tops flush with finished floor. Stubs shall extend above couplings the indicated distance. Where capped stubs are designated, couplings shall be closed with cast iron plugs with screw drive slots.
- C. Underground:
1. Underground conduit stubs shall be terminated at locations indicated, and shall extend five feet beyond building foundations, steps, arcades, concrete walks and paving. Rigid metallic conduit stubs and non-metallic conduit stubs shall be capped by installing a coupling flush in end wall of concrete encasement and plugging with a permitted plug. Project record drawings shall indicate location of ends of underground conduit stubs fully dimensioned and triangulated with reference to buildings or permanent landmarks. These dimensions, including depth below finished grade, shall be marked on project record drawings in presence of the Inspector before backfilling trench. Where extending existing concrete encased stubs, clean, chip and wire brush end of existing concrete and brush on a heavy coat of neat cement paste or epoxy bonding agent.
 2. Over ends of individual underground conduit stubs or groups of conduit stubs, install four-inch by 18-inch deep PVC filled with concrete, flush with finished grade in asphaltic concrete or lawns, and two inches above finished grade in planting areas. Cast a three-inch by three-inch brass plate engraved "ELECT" flush in top of concrete. Secure plate to concrete with brass dowels or as indicated on drawings.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.04 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 26 24 16 - PANELBOARDS AND SIGNAL TERMINAL CABINETS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Lighting and power distribution facilities, including panelboards.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 26 0500: Common Work Results for Electrical.
 - 3. Section 26 0513: Basic Electrical Materials and Methods.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Shop Drawings: Include a front elevation indicating cabinet dimensions, make, location and capacity of equipment, size of gutters, type of mounting, finish, and catalog number of locks. General layout of internal devices, wiring drawings with wire numbers and device connections, vendor cut sheets of devices in enclosure and bill of materials listing description, manufacturer, part number, and quantity of items shall be included.
- C. Installation Instructions: Submit manufacturer's written installation instructions.

1.03 DESIGN REQUIREMENTS

- A. Panelboards:
 - 1. Panelboards shall be wall-mounted, enclosed safety type with 120/240 volt, three-wire solid neutral 277/480 volt, four-wire or 120/208 volt, four-wire solid neutral mains as indicated on Drawings or specified. First panelboard of each building shall be provided with main or sub-feeder circuit breakers where so indicated.
 - 2. Single pole branches shall be molded case, thermal magnetic circuit breakers with inverse time delay, trip free, quick-make, quick-break mechanism and silver alloy contacts. Circuit breakers shall be fully rated, with ampere rating marked on handle and shall indicate on/off and tripped positions. Ground fault interrupters shall be incorporated into circuit breakers where indicated. They shall be listed by UL, or other NRTL as ground fault devices. Provide appropriate lug kit of sufficient size to accommodate the feeders.

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3. Two- and three-pole branches shall be enclosed, and shall be thermal magnetic circuit breakers with inverse time delay, tamper-proof, ambient compensated, single handle, internal common trip, and quick-make, quick-break mechanism with silver alloy contacts. Circuit breakers shall be fully rated or as otherwise indicated on the Drawings.
 4. Main and subfeeder circuit breakers shall be enclosed, thermal magnetic type with inverse time delay, single handle common trip, quick-make, quick-break mechanism, corrosion-resistant bearings and silver alloy contacts. Ampere frame size and trip rating shall be as indicated on Drawings. Breakers over 225 amperes shall be furnished with interchangeable trip units. Handles of main and subfeeder circuit breakers shall be provided cabinet door. Voltage rating shall be as indicated on Drawings.
 5. Circuit breakers shall be fully rated and of one-piece, bolt-on type and shall meet short-circuit interrupting capacity requirements indicated on Drawings. Series rated circuit breaker combinations are not acceptable.
 6. Internal connections shall be fabricated with plated copper bus bars and the busses shall extend for full length of space available for branch circuit breakers. Feeder cable connectors shall be installed at point of feeder entrance. Terminals shall be furnished with copper conductors. Panelboards fed by conductors having over-current protection greater than 200 amperes shall be protected on supply side by over-current devices having a rating not greater than that of panelboards. Copper bussing shall be fully rated. Heat rated bussing is not acceptable.
 7. Except where otherwise indicated, circuit breakers shall be in two vertical rows connected to bus bars in a distributed phase arrangement. Two-pole branches shall be balanced on busses. Single pole branches shall be numbered adjacent to its circuit breaker, with odd numbers on left and even numbers on right.
 8. Specified circuit breaker spaces shall be furnished with hardware required for future installation of circuit breakers.
 9. Provide locking devices for individual circuit breakers. Padlocking devices shall be secured to circuit breakers and by panel dead front plates.
- B. Surge Suppressors: Where indicated on Drawings, provide transient voltage surge suppressors as an integral part of panelboards. Panelboards shall be complete with 200 percent rated copper neutral bus, ground bus and isolated ground bus in addition to requirements of this section. Surge suppressors shall be as follows:
1. Surge Capacity:
 - a. Line-to-neutral for wye systems: 80 KA.
 - b. Line-to-ground: 80 KA.
 - c. Neutral-to-ground: 80 KA, three-phase wye.
 - d. Line-to-neutral plus line-to-ground: 160 KA.

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2. UL 1449 2nd Edition Suppressed Voltage Rating for 208/120 Wye System:
 - a. Line-to-neutral: 400 volts.
 - b. Line-to-ground: 400 volts.
 - c. Neutral-to-ground: 400 volts.
 - d. Maximum continuous over-voltage: 150 volts.
3. EMI/RFI High-Frequency Noise Power Filter (Characteristics):
 - a. 100 KHz at 44 dB.
 - b. 100 MHz at 44 dB.
 - c. 10 MHz at 44 dB.
 - d. 100 MHz at 44 dB.
4. MOVs shall be thermally protected for low current faults and shall be fused with surge-rated fuses. The surge-rated surge current passes and clears the circuit safely if the surge capacity is exceeded. Enhanced diagnostics shall continuously monitor the unit's status and shall include LEDs to signal a reduction in surge capacity or the loss of a suppression circuit. An audible alarm, with test and silence features, shall be furnished in diagnostic package.
5. Each phase or the entire unit shall be replaceable and have bolted-on, tin-plated copper connections. Unit to have UL witnessed fault current rating of 65,000 symmetrical amperes.
6. Surge suppression units shall comply with the following:
 - a. UL certified.
 - b. UL 1283.
 - c. UL 1449.
 - d. IEEE C 62.45.
 - e. IEEE C 62.41.
 - f. Nationally Recognized Testing Laboratory (NRTL) or equal.

C. Panelboard Cabinets:

1. Panelboard cabinets shall be code gage galvanized steel or blue steel; fronts, doors, and trims shall be code gage furniture steel. Cabinets shall be furnished with at least six-inch high gutters at top and bottom where feeder cable size exceeds four gage or where feeder cable passes through cabinet vertically. Cabinets shall be furnished with top and bottom gutters sized as required by inspection department having jurisdiction, but never less than six inches where more than one feeder enters top or bottom of cabinets. Side gutters shall not be less than four inches wide. Width of cabinets shall be 20 inches, unless otherwise indicated on Drawings.

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2. Doors shall be cut true, shall accurately fit opening and finish smooth across joints. Rabbets shall be inside. Hinges shall be entirely concealed except for barrels and pins. Hinge flanges shall be welded to door and trim. Doors shall be equipped with flush type, spring-latching, Corbin locks for metal doors, keyed to Corbin No. 60 keys.
 3. Where contactors, time switches, and control devices are specified or indicated to be installed within panelboard cabinets, a separate compartment and door shall be provided at top of cabinet for such devices. Door shall be sized as required to permit removal of contactor and other devices intact. Gutters shall be provided at sides and top of compartment. Doors shall be equipped with flush type, spring-latching, Corbin locks for metal doors keyed to Corbin No. 60 keys.
 4. Provide and install panelboard manufacturer's permanent circuit number kit option.
 5. Panelboards with control devices in compartment shall arrive at the Project site completely assembled with control devices installed and wired.
 6. Outdoor cabinets shall be NEMA Type 3R. Construction shall be formed from code gage galvanized steel with ANSI No. 61 gray enamel finish. Provide heavy-duty, three point latching, vault type door handles with padlocking provisions. Provide stainless steel or galvanized butt hinges on doors. Padlocks shall be furnished, keyed to Corbin No. 60 keys.
 7. Self-tapping screws and bolts not permitted.
- D. Panelboard Schedule: Provide a neatly typewritten schedule with number or name of room or area, or load served by each panelboard circuit. Room numbers or names shall be determined at the Project site and shall not necessarily be those indicated on the Drawings. Schedule shall also indicate panel designation, voltage and phase, building and distribution panel or switchboard from which it is fed. Schedule shall be installed in a frame under transparent plastic 1/32 inch thick on inside of each panelboard cabinet door.
- E. Panelboard nameplate: Provide a nameplate identifying panelboard. Plates shall be black and white plastic nameplate stock, with character cut through black exposing white and shall bare designation of service. Name plate shall be mechanically fastened to switchboard.
- F. Provide additional labeling on dead-front of panelboard. Label shall be a P-Touch or equal with a minimum width of 3/8 inch with black letters on white background. Label shall re-identify panelboard and also identify name and location of power source feeding this panel. Location information shall include building name if located in different building and name or room location. If power source is installed in same room, label should indicate source name and "In this Room"
- G. Panelboard Standards: Panelboards shall be UL, or other NRTL listed and labeled. Panelboards shall meet latest revisions of following standards:
1. California Electric Code, Article 384.
 2. UL 67, Panelboards.

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3. UL 50, Cabinets and Boxes.
4. UL 943, GFCI.
5. UL 489, Molded Case Circuit Breakers.
6. NEMA PB1.
7. Federal Specifications W-P- 115C and WC-375B.

H. Signal Terminal Cabinets:

1. Signal terminal cabinets shall conform to the Specifications for panelboard cabinets, except as modified herein.
2. Terminal cabinets shall be flush type, with two-inch trim or surface mounted type, as indicated on Drawings. Terminal cabinets shall be furnished with sections and barriers to separate each system. Sections over 24 inches in width shall be provided with double doors and locks. Terminal cabinets, or sections of terminals housing separate systems, shall measure 12 inches long by 18 inches high by 5 $\frac{3}{4}$ -inch deep, unless otherwise indicated on Drawings. Trims for sectional cabinets shall be of one-piece construction.
3. Terminal cabinets shall be furnished with $\frac{3}{4}$ inch thick plywood. Plywood shall be fastened in place with machine screws or factory installed mounting screws.
4. Flush-mounted terminal cabinets shall be finished as specified for flush-mounted panelboard cabinets. Surface and semi-flush mounted terminal cabinets shall be finished as specified for surface-mounted panelboard cabinets.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Panelboards shall be manufactured by Siemens, W.A. Benjamin, General Electric, Cutler Hammer, Square D or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Panelboards shall be located so they are readily accessible and not exposed to physical damage.
- B. Panelboards installed outdoors shall be specifically listed for wet locations and shall be weatherproof in NEMA Type 3R cabinets.

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- C. Panelboard locations shall provide sufficient working space around panels to comply with the California Electrical Code.
- D. Panelboards shall be securely fastened to structure and mounted on surface by at least four points.
- E. Unused openings in cabinets shall be effectively closed as required by the manufacturer.
- F. Cabinets shall be grounded as specified in Article 250 of the California Electrical Code.
- G. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the enclosure.
- H. Lugs shall be suitable and listed for installation with the conductor being connected.
- I. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.
- J. Maintain the required bending radius of conductors inside the cabinet.
- K. Clean the cabinet of foreign material such as cement, plaster, and paint.
- L. Distribute and arrange conductors neatly in the wiring gutters.
- M. Use the manufacturer's torque values to tighten lugs.
- N. Before energizing panelboards, the following steps shall be taken:
 - 1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been provided.
 - 2. Remove shipping blocks from component devices and panelboard interiors.
 - 3. Manually exercise circuit breakers to verify they operate freely.
 - 4. Remove debris from panelboard interior.
- O. Follow manufacturer's instructions for installation.
- P. Do not install in highly corrosive environments, unless rated for the application.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

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3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 28 31 00 – FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fire alarm system shall consist of fire alarm control panel or networked nodes of the same make and be CSFM (California State Fire Marshall) listed for the application.
2. Labor, equipment, materials, connections, testing, and performance of operations in the installation of fire alarm system.

B. Related Requirements:

1. Division 01 General Requirements.
2. Section 26 0500: Common Work Results for Electrical.
3. Section 26 0513: Basic Electrical Materials and Methods.
4. Section 26 0519: Low-Voltage Wire (600 Volt AC).
5. Section 26 0526: Grounding and Bonding.
6. Section 26 0533: Raceways, Boxes, Fittings, and Supports.

1.02 SYSTEM REQUIREMENTS

A. Fire detection system shall continually supervise and monitor the following initiating, signaling, and monitoring circuits:

1. Manual fire-pull stations.
2. Smoke and heat detectors, duct detectors, multicriteria detectors, combination smoke/heat/CO Detectors, including detectors installed under other sections.
3. Fire sprinkler flow and tamper switches. In existing installations also include PIV tamper switches.
4. Alarm signaling circuits including alarm bells, horns and visual alarm units.
5. Annunciators.
6. Power supplies and batteries.
7. Interconnection with Central and Autonomous Public Address systems, telephone network system, Clock System-Classroom or Program schedule change, and other systems required by code.

B. System controls shall be UL listed for power limited applications in accordance with California Electrical Code.

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- C. System shall be listed for Internet of Things (IoT) security in compliance with UL 2900.
- D. The fire alarm devices and equipment shall be listed for installation for the fire alarm control panel to which they are being connected.
- E. Complete installation shall conform to the version of NFPA 72, California Fire Code, California Building Code (CBC), and California Electrical Code (CEC) as approved by DSA on stamped drawings.
- F. System labels and devices programming addresses shall be based on final signage and building labeling submittals. For existing facilities contractor shall obtain from Owner Authorized Representative a copy of the current site layout and building labeling designations.

1.03 CERTIFICATION

- A. Certification: Installation of fire alarm system shall not begin until Shop Drawings, including State Fire Marshal listing numbers of fire alarm components, are submitted and reviewed by the Architect. Written certification by fire alarm equipment distributor or manufacturer shall be submitted to the Architect stating that system and its component parts are as approved and listed by the State Fire Marshal, and that the design conforms to requirements set forth in CBC.

1.04 PERFORMANCE

- A. System shall be fully programmable, configurable, and expandable in the field without special tools or PROM programmers and shall not require replacement of memory ICs. Installer shall provide a CD of system installed software, site specific system programming and information and tools required to re-program or modify the system.

1.05 SYSTEM FUNCTIONAL OPERATION

- A. When a fire alarm condition is detected by one of the system initiating devices, the following functions shall occur:
 - 1. System alarm LED shall flash.
 - 2. Local sounding device in panel shall be activated.
 - 3. The LCD display shall indicate type of device, custom label location label and point status alarm condition.
 - 4. Appropriate change of status message shall be transmitted to remote annunciator(s).
 - 5. Automatic programs assigned to alarm point shall be executed and associated indicating devices and relays activated.
 - 6. In the event of a fire alarm control panel activation, manual and automatic electronic tone or electromechanical bell class passing signals shall be disabled.

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7. In the event of a fire alarm condition the Central and Autonomous Public Address System shall be overridden.
 8. UDACT (Universal Digital Alarm Communicator Transmitter) shall activate.
- B. Trouble and Supervisory Conditions.
1. When any trouble condition is detected the following functions shall occur:
 - a. System trouble LED shall flash.
 - b. Local sounding device in panel shall be activated.
 - c. The LCD display shall indicate the type of trouble and custom label location associated with the trouble condition and its location. Unacknowledged alarm messages shall have priority over trouble messages. If such an alarm is displayed, then trouble messages shall not be displayed.
 - d. Appropriate message shall be transmitted to remote annunciators.
 - e. UDACT shall activate.
- C. When any supervisory condition occurs such as a sprinkler valve tamper, the following function shall occur:
1. System supervisory LED shall flash.
 2. Local sounding device in panel shall be activated.
 3. Appropriate message shall be transmitted to remote annunciators.
 4. UDACT shall activate.
- D. Activation of control panel ACKNOWLEDGE switch in response to a single new alarm, trouble or supervisory condition shall silence panel sounding device and change system alarm, trouble, or supervisory LED from flashing to steady-ON. If additional new alarm, trouble, or supervisory conditions exist in the system; activation of this switch shall advance display to next alarm, trouble, or supervisory condition that exists, and shall not silence local audible device or change LED to steady until new conditions have been so acknowledged. New alarm conditions shall always be displayed before new trouble conditions. Occurrence of a new alarm, trouble, or supervisory condition shall cause panel to resound, and sequences as described above, shall repeat.
- E. Activation of the signal silence switch shall cause appropriate notification (indicating) appliances and relays to return to normal condition. Selection of notification appliance circuits and relays silenced by this switch shall be fully programmable.
- F. Activation of system reset switch shall cause electronically latched initiating devices or zones, as well as associated output devices and circuits, to return to normal condition after sixty seconds of alarm. If alarm conditions exist in system after system reset switch activation, system shall then re-sound alarm conditions as indicated hereafter.

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- G. Activation of lamp test switch shall turn on LED indicators, LCD display, and local sounding device in panel, and then return to previous condition.
- H. Fire alarm indicating appliances may be silenced or extinguished, after one minute, by operating signal silence switch at the FACP or by use of key supervised alarm silence switch at remote annunciators. A subsequent zone alarm shall reactivate signals. Audible indicating appliances shall be automatically silenced after no less than five nor more than ten minutes of operation. Visual indicating appliances shall be extinguished at system reset, or automatically after no less than five nor more than ten minutes of operation. Fire sprinkler flow alarm bells shall not silence until the contacts in the fire sprinkler flow switch return to the normal non-alarm state. Appropriate signage must be installed on or next to the sprinkler alarm bell.
- I. System's circuits including but not limited to initiation, indicating, and equipment interfacing shall be monitored for open or short circuit and ground fault conditions, these conditions shall be indicated on the Fire Alarm Control Panel and Annunciator displays while remaining circuits continue to operate normally.
- J. Notification appliance circuits shall be silence able for testing purposes by authorized persons. Protected passcodes, keys, or another secure method that does not require entering into the system programming shall be used.

1.06 POWER REQUIREMENTS

- A. The fire alarm control panel and remote power supply shall receive 120 VAC power, 60 Hz, through a dedicated 20 amps circuit. Circuit breaker protection for the dedicated fire alarm power circuits shall be equipped with a handle lock-on device; the breaker handle shall be colored red and labeled "FIRE ALARM". Clearly label the Electrical panel name, location and circuit number on the inside of the fire alarm control panel and remote power supplies using a p-touch style labeling system. Transient voltage surge suppression shall be provided at the 120VAC input terminal.
- B. System shall be provided with sufficient battery capacity to operate entire system upon loss of normal 120 VAC power, in a normal quiescent mode, for a period of 24 hours with five minutes of alarm indication at end of this period. System shall automatically transfer to standby batteries upon power failure. Battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70 percent capacity in 12 hours.
- C. Circuits requiring system operating power shall be 24 VDC and shall be individually protected at control panel.

1.07 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Component Plan Submittal: Availability and listing for its application shall be verified for system components before presentation of the submittal. Include the following information and details as applicable:
 - 1. Installer name, address, telephone number.

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2. List of system components, equipment and devices, including manufacturer model numbers, quantity and California State Fire Marshal listing numbers, mounting heights, and symbols per district symbol list.
 3. Copies of manufacturer specification sheets for equipment and devices indicated. Highlight or identify the specific components on Catalog cut sheets.
 4. Voltage Drop Calculations: Include the following information for the worst case:
 - a. Point-to-point or Ohms law calculations.
 - b. Zone used in calculations.
 - c. Voltage drop percent. Voltage drop shall not exceed manufacturer's requirements. If voltage drop exceeds ten percent, indicate manufacturer listed operating voltage ranges for equipment and devices.
 5. Battery types, amp hours, and load calculations including the following:
 - a. Normal operation: 100 percent of applicable devices for 24 hours to equal control panel amps plus list of amps per device that draw power from the panel during standby power condition including, but not limited to, zone modules, detectors and devices as identified.
 - b. Alarm condition: 100 percent of applicable devices for five minutes to equal control panel amps plus list of amps per device that draw power from panel during alarm condition including, but not limited to, the following:
 - 1) Zone modules.
 - 2) Signal modules.
 - 3) Detectors.
 - 4) Signal devices.
 - 5) Annunciator.
 - 6) Other devices as identified.
 - c. Normal operation plus alarm operation load calculation shall include total amp hours required and total amp hours provided.
 6. Provide one copy of testing procedures.
- C. Shop Drawings: Provide Shop Drawings, in the same size as the design Drawings, include the following:
1. Provide drawing scale, elevations of system enclosures, and actual layout of the Fire Alarm Control Panel, power supply, annunciator, and main system components.
 2. Site Plan indicating PIV and related fire sprinkler system devices and equipment to be monitored or supervised; such as water flow valves, and

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main equipment such as control panels, power supplies, annunciators, and components such as outdoor wall-mounted horns, sprinkler bells, pull boxes, underground pull boxes, wiring routes on buildings exteriors and underground locations. In each conduit or raceway run indicate conduit sizes, and quantities and type of wires.

- a. In existing facilities make a distinction between existing and new installation.
3. Complete battery calculations, and voltage drop calculation shall be included; these calculations shall be based on the devices maximum UL current rating.
4. One line drawing for the entire system network indicating system components and wiring. The one line diagram shall show but not be limited to panel to panel interconnections, conductors gage and quantity, conduit size and type (designation) and specific function.
5. System panel one-line drawings indicating the quantity and type (designation) of conductors entering and exiting the fire alarm terminal cabinet in each building (enclosure) for initiating, notification, or other command control functions required for complete system operation:
 - a. Individual floor or building plan view drawings indicating device locations including end of line resistors “EOLR” in accordance with the legend provided.
 - b. Individual point addresses for initiation and notification devices.
 - c. Device “typical” wiring diagrams. These drawings shall indicate specific termination details for peripheral equipment and interface devices.
6. Provide interfacing with equipment furnished by others including voltages, and other required coordination items. Refer to 3.01-B.
7. Each of the pictorial diagrams included shall appear identical to the products they are intended to depict, in order to speed installation of the system, and to enhance the accuracy of the installation Work. Typical wiring diagrams or catalog sheets are not permitted.
8. Background Drawings with device locations of DSA approved drawings are available in electronic format and may be obtained from the Owner Authorized Representative (OAR). Contractor is solely responsible for the accuracy and completeness of shop drawings. Buildings that are not part of the contract shall be clearly identified “NOT IN CONTRACT”. Shop Drawings shall be prepared in the latest version of AutoCAD with three – CD ROM electronic copies submitted along with full sized Shop Drawings.
9. Other installation and coordination drawings specifically related to this section shall be included as follows:
 - a. Size A (8 ½ by 11) and size B (11 by 17) shall be bound into the manual.

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- b. Larger drawings shall be folded and inserted into transparent envelopes and bound into the manual.
- 10. Installation and coordination drawings for items in other sections shall be included with submittal of Shop Drawings. Submit blue line copies and one reproducible copy of installation and coordination drawings.
- 11. Samples: Provide Samples of material and equipment as required by the Architect. If Samples are requested, they shall be submitted within ten days from date of request.
- D. In addition to the above requirements, provide submittals to meet any additional requirements of DSA.
- E. Submittal of Equivalent Systems:
 - 1. In addition to the submittal requirements of this section, if an equivalent system listed in Section 2.01A is submitted in lieu of the designed system shown on DSA approved drawings, the Contractor shall also submit a letter stating that the system is equivalent, and that device locations and quantities of devices are unchanged. Attached to this letter shall be a copy of the revised equipment schedule with corresponding CSFM numbers and a cut sheet for each item.
- F. Modifications or additions to existing fire alarm systems shall be compatible and of the same manufacturer as the existing system. Contractor shall be solely responsible for engineering, plan check and any fees resulting from an installation that deviates from this requirement.
- G. Prior to Substantial Completion submit to the Architect or Engineer of Record and to Owner Authorized Representative a complete updated set of the Shop Drawings showing changes made to the Fire Alarm System during construction. These drawings will become the System As-Built Drawing set for the Fire Alarm System Owner's Manual.

1.08 QUALITY ASSURANCE

- A. Installer shall have successfully completed at least five projects of equal scope in the past five years, and have been in business of furnishing and installing fire alarm systems of this type for at least five years.
- B. Installer shall be a factory authorized distributor and service provider for the brand of equipment offered and shall provide documentation to the Architect upon request.
- C. Installer shall maintain a fully equipped service organization capable of furnishing repair service to the equipment and shall maintain a spare set of major parts for the system at all times.
- D. Installer shall furnish a letter from manufacturer of equipment certifying equipment has been installed according to factory standards and that system is operating properly.

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- E. Certifications: Installer shall submit certification from the equipment manufacturer indicating that installer is an authorized representative of the equipment manufacturer and is trained on network applications.
- F. Materials and equipment installed shall be new.
- G. Equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. Furnish a letter from the manufacturer of major equipment, which certifies that the installer is an authorized distributor and that the equipment has been installed according to factory intended practices. Furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.
- H. Installer shall be Underwriters Laboratory (UL) listed company under the UUJS classification, and shall certify that the installation has been made in accordance with UL requirements.
- I. The fire alarm contractor shall have a NICET II Certified Technician on staff in their facility directly involved with this project to ensure technical expertise to this project and adherence with these specifications.
- J. Contractor or Installer's Electricians and fire and life safety technicians shall be certified in accordance with Labor Code sections 3099, and 3099.2, and section 209.0 of the California Code of Regulations.
- K. System startup and testing shall be performed under the direct observation of the Project Inspector and OAR. Provide a legible half size reproduction of the original completed fire alarm red-line drawings (this copy will be retained by the Owner), an accurate copy of the fire alarm system points list, and a copy of the construction drawings on CD in AutoCAD format.
- L. At the time of installation the most current software package available shall be provided.
- M. Provide at the time of Owner Acceptance of the installation, equipment, and updated software which is to include the appropriate operating system, pass-codes, electronic keys and program disks, manuals and cables employed in the installation of the system. These components shall be delivered to the OAR.
- N. Provide a backup copy of the most current software revision, in disk format. This copy shall be delivered to the OAR
- O. A software license agreement shall be made available for the responsible Owner representative to sign at the time of training.

1.09 WARRANTY

- A. The Fire Alarm Equipment Manufacturer shall provide a three year material warranty. Installer shall provide a three year labor warranty.
- B. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer for a period of five years after expiration of the warranty.

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PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Fire alarm equipment shall be standard products of Gamewell-FCI, to match existing campus system manufacturer.
- B. Catalog and model numbers listed are intended to establish type and quality of equipment and system design as well as operating features required. Deviations from intended functions of specified system are not permitted. Equipment shall not be ordered or installed until such equipment has been reviewed and approved by the Architect.

2.02 FIRE ALARM CONTROL PANEL (FACP) OR NETWORK NODES

- A. Existing Fire Alarm Control Panel to be networked with main campus Fire Alarm Control Panel as indicated on drawings.
- B. Operator Control:
 - 1. Acknowledge Switch: Activation of control panel acknowledge switch in response to a single new trouble or alarm condition shall silence panel sounding device and change system alarm or trouble LED from flashing to steady-ON. If additional new alarm or trouble conditions exist in system, activation of this switch shall advance display to next alarm or trouble condition that exists, and shall not silence local audible device or change LED to steady until new conditions have been so acknowledged. New alarm conditions shall always be displayed before new trouble conditions. Occurrence of a new alarm or trouble condition shall cause panel to resound, and sequences as described above, shall repeat.
 - 2. Signal (Alarm) Silence Switch: Activation of the signal silence switch shall cause programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully fielded programmable within the confines of applicable standards at the job site. The FACP software shall include silence inhibit and auto-silence timers.
 - 3. Alarm Activate (Drill) Switch: Alarm activate switch shall activate notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
 - 4. System Reset Switch: Activation of the System Reset switch shall cause electronically-latched initiating devices, appliances or software zone, as well as associated output devices and circuits, to return to their normal condition.
 - 5. Lamp Test Switch: Switch shall activate local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personnel.
 - 6. Hot Button Switch: Hot Button Key switch shall be provided in FACP to disable all output devices for testing or repair of system. Key switch shall silence all horn and strobes, disable PA cutouts, HVAC shutdowns, door

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closures, and Autonomous PA systems. Key switch shall be password protected to enable function. LED indicator shall illuminate a trouble condition while Hot Button Switch is activated and shall turn off when system is re-enabled.

C. System Capacity and General Operation

1. The control panel or each network node shall provide or be capable of expansion to 636 minimum intelligent addressable devices in smaller systems, and 3180 intelligent addressable devices for larger systems.
2. The control panel or each network node shall include Form-C alarm, trouble, supervisory, and security relays rated at a minimum of two amps at 30 VDC. It shall also include four Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notifications Appliance Circuits.
3. The control panel or each network node shall support up to eight output modules (signal or relay), each with eight circuits for a total of 64 circuits for the smaller capacity panels, and 12 output modules for a total of 96 circuits for the larger capacity panels. Programmable notification appliance circuits shall be class B.
4. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire alarm system.
5. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
6. The system shall allow the programming of any input to activate any output or group of outputs. The FACP shall support up to 20 logic equations, including “and” “or” and “not”, or timed delay equations to be used for advanced programming. Logic equations shall require the use of a PC with software utility designed for programming.
7. The FACP or each network node shall provide the following features:
 - a. Drift compensation to extend detector accuracy over life. Drift Compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
 - b. Detector Sensitivity tests, meeting requirements of NFPA 72 Chapter seven.
 - c. Maintenance alert, with two levels (maintenance alert or maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
 - d. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be 0.5 to 2.35 percent per foot for photoelectric

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detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also support sensitive advance detection laser detectors with an alarm level range of 0.03 percent per foot to one percent per foot. The system shall also include up to nine levels of Pre- alarm, selected by detector, to indicate impending alarms to maintenance personnel.

- e. Circuit boards, programming, and interconnecting cables to enable the system to display or print system reports.
 - f. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.
 - g. PAS pre-signal testing in accordance with California Fire Code (CFC) and NFPA 72 requirements.
 - h. Rapid manual station reporting (less than three seconds) shall meet CFC and NFPA 72 requirements for activation of notification circuits within ten Seconds of initiating device activation.
 - i. Periodic detector test, conducted automatically by the software.
 - j. Self-optimizing pre-alarm for advance fire warning, which allows each detector to learn its particular environment and set its pre-alarm level to just above normal peaks.
 - k. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
 - l. Walk test, with a check for two detectors set to same address.
 - m. Control-by-time for non-fire operations, with holiday schedules.
 - n. Day or night automatic adjustment of detector sensitivity.
 - o. RS 232 serial port to support a District supplied printer to be used for silent testing and certification of the system.
8. The FACP shall be capable of coding main panel(s) node notification circuits in temporal code (NFPA 72 A-2-2.2.2). The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific “sync pulse”.
9. Network Communication:
- a. The network architecture shall be based on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol. The protocol shall be based on ARCNET or equivalent non-proprietary protocol.
 - b. Failure of any node shall not cause failure or communication degradation of any other node or change the network communication protocol among surviving nodes located within distance limitations. A node may be an intelligent Fire Alarm Control

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Panel (FACP), Network Control Station PC (NCS) or Network Control Annunciator (NCA).

- c. Each network node address shall be capable of storing Event Equations which shall be used to activate outputs on one network node from inputs on other network nodes.

D. System Display:

1. Utilize the 640-character display option. The design of the CPU shall provide for a configuration with the 640-character display mounted on the front of the unit in place of the standard 80-character display.
2. The 640-character display shall provide the controls and indicators used by the system operator: The 640 character display shall include the following operator control switches; Acknowledge, Alarm, Silence, Alarm Activate (drill), System Reset and Lamp Test.
3. The display shall annunciate status information and custom alphanumeric labels for intelligent detector, addressable modules, internal panel circuits, and software zones.
4. The 640-character display shall provide ten Light-Emitting-Diodes (LEDs) that indicate the status of the following system parameters: AC Power and Network Communication, Fire Alarm, Pre alarm Warning, Security Alarm, Supervisory Event, System Trouble, Alarm Silence, Disabled Points, CPU failure.
5. The 640-character display shall use ten “soft” keys for screen navigation or to accomplish dedicated programming functions. Full programming access shall require use of a laptop and the proper programming utility. The programming utility shall be provided to the OAR who will forward it to the local maintenance area representative.
6. The system shall support the display of battery charging current and voltage on the LCD display.

E. Signaling Line Circuits (SLC):

1. Each FACP or FACP network node shall support a minimum of one SLC for the smaller panels and ten SLC's for the larger panels. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric or thermal) and 159 intelligent modules (monitor or control) for a loop capacity of 318 devices.
2. CPU shall receive analog information from intelligent detectors to be processed to determine whether normal, alarm, pre-alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors including the accumulation of dust in each detector. The analog information shall also be used for automatic detectors testing and for the automatic determination of detector maintenance requirements.

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F. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of 0.030 steel with provisions for electrical conduit connections into the sides and top.
3. The supplied door shall include a key lock and shall include glass or other transparent opening for viewing of indicators. For convenience, the door may be site configured for either right or left hand hinging.

G. Power Supply:

1. An off-line switching power supply shall be available for the fire alarm control panel or network nodes.
2. Provisions shall be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. Over-current protection shall be provided on power outputs. The power supply shall provide an integral battery charger. Battery arrangement may be configured in the field.
4. The power supply shall continuously monitor field wires for earth ground conditions, and shall have the following LED indicators:
 - a. Ground Fault LED.
 - b. AC Power Fail LED.
 - c. NCA-2 on LED (4).
5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide power for the FACP or network node(s).
6. The main power supply shall provide a battery charger using dual rate charging technology for fast battery recharge and be capable of charging batteries up to 60 AH for the smaller panels and 200 AH for larger panels.

2.03 POWER SUPPLIES

- A. Remote Notification Appliance Circuit (NAC) extender power supplies shall be furnished with main printed circuit board, transformers, lockable cabinet, and batteries. Unit shall be configured to drive 4 notification appliance circuits. The remote power supplies shall be configured with a monitor module to report trouble conditions to the controlling FACP via an SLC. Triggering of NAC inputs shall be directly controlled from the FACP without the use of addressable control or relay modules.

2.04 PERIPHERAL DEVICES AND EQUIPMENT

- A. Smoke Detectors: Smoke Detectors shall be addressable. Detector shall be microprocessor based, using a combination of photoelectric, and thermal sensing technologies. The smoke detector shall have its loop number and electronic

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address permanently and clearly labeled onto the device base using a p-touch type labeling system. The label shall be visible without re moving the detector head.

- B. Non-Explosion Proof Automatic Addressable Heat Detectors shall be combination rate-of-rise and fixed-temperature type. When fixed-temperature portion is activated, units shall provide visual evidence of such operation (LED). The location of the heat detector must be clearly marked below the ceiling and the detector must be readily accessible. The heat detector shall have its electronic address permanently and clearly labeled onto the device and be readily accessible. For spaces such as attics, where the ambient temperature can reach around 150° degrees Fahrenheit in hot days, use detectors rated for the application. The heat detector shall have its loop number and electronic address permanently and clearly labeled onto the device using a p-touch labeling system. The label shall be visible without removing the detector head.
- C. Monitor Modules:
1. Monitor modules shall connect a supervised zone of conventional initiating devices, N.O. dry contact devices, including four-wire smoke detectors, to one of SLC loops. Monitor module shall install in a four-inch square by 2 1/8-inch deep electrical box. The module shall have its loop number, electronic address, and function label on the front cover using a P-Touch type or equal labeling system.
 2. Monitor module shall provide address-setting means using rotary decimal switches and shall store an internal type of device. An LED shall be provided which shall flash under normal conditions indicating that monitor module is operational and in regular communication with control panel.
- D. Relay Modules:
1. Relay Modules shall provide as a minimum one set of form “C” dry contacts and have its loop number, electronic address, and function labeled on the front cover using a P-Touch type labeling system.
 2. Provide a buffer relay that is part of the control system if controlled circuit(s) exceeds the voltage or current rating of the relay module.
 3. Relays used to interface control of other systems shall be electrically supervised and shall only be wired in a fail-safe mode of function during a power failure.
- E. Horns and Strobes: Horns and strobes shall be products of the same manufacturer. In order to establish a standard of quality, items are specified from the products manufactured by System Sensor, to match existing. Addressable or multifunction two wire indicating (Audible or Visual) appliances shall not be acceptable.
1. Alarm horns shall be polarized and operated by 24 VDC. Entire unit shall be red finish. Horn assemblies shall be furnished with separate wire leads for in or out wiring for legs of associated signal circuits. Tapping of signal device conductors to signal circuit conductors is not permitted. Suitable

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gaskets shall be provided for weatherproof installation. Horns shall provide a minimum sound pressure level of 100 dB at 10 feet. Horns shall be mounted on manufacturer's recommended outlet boxes. Provide horns with a back box skirt on indoor surface mount outlet boxes.

2. Horn/strobe shall be wall mounted or ceiling mounted System Sensor. Horn/strobe shall operate on two separate two wire 24 VDC polarized circuits and shall be provided with a semi-flush mounting plate. Entire unit shall be red finish. Strobe light shall have a clear Lexan lens. The word "FIRE" shall be printed on the two sides of the strobe body. Horn shall provide a minimum sound output of 100 dB at 10 feet. The strobe shall provide a selectable minimum light intensity of 15, 30, 60, 75, 90, 110, 135, 150, or 185 Candela as indicated on Drawings to meet or exceed requirements of CBC, CHAPTER 11B AND ADAAG and UL 1971. Horn/Strobes shall be mounted on manufacturer recommended outlet boxes. Provide a model No. BBS-2 back box skirt on indoor surface mounted outlet boxes.
 3. Strobe indicating appliances shall be System Sensor or equal. Devices shall be UL listed and shall be wall-mounted. Entire unit shall be red finish. Strobe light shall have a clear Lexan lens. The word "FIRE" shall be printed on two sides of the strobe body. Strobes shall meet CBC, CHAPTER 11B AND ADAAG and UL 1971 requirements. The strobe shall provide a selectable minimum light intensity of 15, 30, 60, 75, 90, 110, 135, 150, or 185 Candela as indicated on the Drawings to meet or exceed requirements of CBC, CHAPTER 11B AND ADAAG and UL 1971. Strobes shall be mounted on manufacturer recommended outlet boxes. Provide a model No. BBS-2 back box skirt on indoor outlet boxes.
 4. Strobe synchronization modules if required shall be System Sensor or equal, to be installed in conjunction with two or more strobes located in same room or corridor or as indicated on Drawings. (Strobe synchronization modules must be compatible with installed strobes).
- F. Network Cables or SLC or Annunciator Data or Audio Output Cables: The construction and physical characteristics such as aqua-seal water block, wire gage, insulation and jacket types, etc. shall not be altered. Equivalent cables must be specifically approved and recommended by the manufacturer of the fire alarm system equipment. Substitutions will require review from the Architect or Engineer of Record.
- G. The cable types listed below are based and specified on the recommendations of Notifier Fire Alarm Systems. If the submitted fire alarm system requires a different cable configuration with additional conductors, multi-conductor versus twisted pairs, etcetera, other than as is specified above, then request a substitution to supply and install the configuration of cables by the make and model of the fire alarm system that is to be installed.
1. Indoor Network and EVAC System Audio Output Circuit(s) applications shall be in conduit or in surface mounted raceway as indicated on drawings:

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West Penn No. D980, one pair 18 gage solid copper, unshielded, Copolene II insulated and PVC jacketed, or equal.

2. Indoor SLC applications in conduit or in surface mounted raceway where it is indicated on drawings: West Penn No. D990, one pair 16 gage solid copper, unshielded, Copolene II insulated and PVC jacketed, or equal.
3. Indoor Annunciator applications in conduit or in surface mounted raceway where it is indicated on drawings: West Penn No. D975, one pair 18 gage solid copper, shielded, Copolene II insulated and PVC jacketed, or equal.
4. Outdoor or Underground Network Applications: West Penn AQ224, two-conductor 18 gage stranded copper, unshielded, water-blocked construction and PVC insulated, or equal.
5. Outdoor or Underground SLC applications: West Penn AQ225, 2-conductor 16 gage, AQ226, 2 conductor 14 gage, or AQ227, 2 conductor 12 gage stranded copper, unshielded water-blocked construction and PVC insulated, or equal.
6. Outdoor or Underground Annunciator applications: West Penn AQ293, 2 conductors, 18 gage stranded copper, shielded water-blocked construction and PVC insulated, or equal.

H. Protective Covers

1. Provide protective covers for pull stations, smoke and heat detectors, and audible and visual devices located in areas occupied by students that can be subjected to vandalism such as gyms, restrooms, locker and shower rooms, and all hallways and corridors associated with these spaces. Installation of cover must not protrude over current ADA limitations.

PART 3 - EXECUTION

3.01 GENERAL

- A. Fire alarm system shall not be used for any purpose other than fire alarm functions.
- B. Fire alarm shall be interconnected but not limited to the following systems:
 1. Systems required by code to be connected to the fire alarm systems shall be connected.
 2. Public address system for disabling the manual and automatic bell or tone class passing signals. Manual and automatic class passing signals shall not be operable during alarm conditions.
 3. Ventilation systems where required for the purpose of fan shutdown
 4. Damper control or smoke management systems.
 5. Water based fire sprinkler systems.
 6. Chemical fire extinguisher systems.
 7. Central and Autonomous PA system(s).

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- 8. Fire pump controller for required signaling and trouble supervision.
- C. Fire alarm system shall not be interconnected to any of the following:
 - 1. Sump warning systems,
 - 2. Carbon monoxide detection systems.
 - 3. Methane gas detection systems.
 - 4. Other unrelated system.

3.02 SYSTEM INSTALLATION

- A. Install required conductors to devices indicated on Drawings. Provide required conductor terminations to devices for a complete system to function as specified and indicated on Drawings. Refer to Section 26 0519: Low-Voltage Wire (600 Volt AC), for installation and color coding requirements.
- B. Splices are not allowed in junction boxes. Terminations shall be in terminal cabinets or on equipment terminals.
- C. Conductors shall be installed within conduits, boxes, and terminal cabinets in a totally enclosed installation. Furnish and install conductors required to connect incoming and outgoing circuits, including spare conductors, to terminal strips within terminal cabinets.
- D. Wiring within equipment and terminal cabinets shall be installed to conform to contract documentation and NFPA 72 standards, and shall be terminated on terminal blocks having terminals for required connections. Wiring shall be cabled, laced, and securely fastened in place so that no weight is imposed on equipment or terminals.
- E. Install required terminal blocks within terminal cabinets. Terminal blocks shall be installed on inside back of cabinets only, not on side. Incoming wiring shall be terminated on the left side of terminal blocks; outgoing wiring shall be terminated on the right side of the terminal blocks.
- F. Conductors shall be color-coded per specification section 26 0519 Low Voltage wires and tagged with code markers at terminal cabinets, and equipment. A wire index shall be typed and installed on terminal cabinet doors. Index shall be covered with clear plastic adhesive covers. Wiring shall be identified as to building and location of devices in the index.
- G. Wiring within equipment and terminal cabinets shall be carefully strapped, and shall be formed in rectangular configuration. Wires shall be properly numbered in numerical order and shall maintain same number throughout the Project site.
- H. Complete installation shall comply with local building codes and applicable provisions of the California Electrical Code, California Fire Code and the NFPA 72 National Fire Alarm Code.
- I. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Do not scale Drawings to determine locations and routing of conduits and outlet boxes. Location of outlet boxes and equipment shall

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conform to architectural features of the building and other Work already in place, and must be ascertained in the field before the start of Work.

- J. Drawings generally indicate Work to be provided, but do not indicate all bends, transitions or special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits are to be installed, and furnish and install required fittings.
- K. Provide P-touch label of approximately one inch wide with red lettering for each initiating device that is hidden from view. Tags shall indicate the name and type of device: Heat Detector, or Duct Smoke Detector. Tags shall be permanently attached on access panel or t-bar grid which is used to access a hidden device.

3.03 SYSTEM PROGRAMMING

- A. Programming shall be performed in accordance with District requirements set forth in this section – the local authority having jurisdiction and applicable codes. If a conflict arises or a clarification is required, the contractor through the project's OAR shall contact the Districts Fire Life Systems Testing Group (FLSTG) for clarification
- B. As part of the 50 percent construction completion label devices and locations in the manner indicted in the attached guidelines on a separate copy of the shop drawings. Request a meeting with OAR, Project Inspector, and representative of FLSTG to review, finalize and obtain approval of the proposed device, equipment and location descriptors that will be programmed into the system. The District may at time of substantial completion request minor changes to program descriptors if needed to conform to site conditions.
- C. The following functions and features as required by the site or system configuration and installed peripheral equipment and systems shall be programmed into district fire alarm systems. The definition of programming shall include but not be limited to the use of a built in keyboard, the use of a connected PC with the appropriate software, dip or rotary switches, wiring or installable or removable jumpers as required or provided in the fire alarm equipment.
 - 1. Signal Silence Switch Inhibit: The audible signal silence switch located on the remote fire alarm annunciator(s) or any fire alarm control panel(s) shall be programmed to not silence the audible or extinguish the visual alarm circuits during the first minute (60 seconds) of alarm activation. Activation of this switch shall silence only the audible signals. Enabling or disabling this feature shall be allowed only if approved by the local Fire Marshal and District's Supervising Electrical Engineer, and authorized District maintenance personnel. The activation feature shall be protected by a maintenance level password.
 - 2. Audible Notification Appliance Circuits: Audible notification appliance circuits shall be programmed to emulate the temporal code (ANSI S 3.41) from fire alarm audible appliances (horns). This coding shall originate and be controlled by a single coder residing within the FACP(s). The use of coders within remote power supplies either mounted adjacent to an FACP or at a remote location or directly by an audible notification appliance will not be permitted. Programmable audible notification appliances shall be

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configured to emulate a steady tone at approximately 1000 Hz. Audible notification appliance circuits shall be programmed to be silenced as described above. Notification appliance circuits throughout the site shall be activated by any alarm initiating device. Coded audible signals shall be controlled by a single synchronized FACP.

3. Visual Notification Appliance Circuits: Visual notification appliance circuits shall be programmed to provide steady non-coded power to the visual appliances (strobes). As required by code and the system configuration, a synchronization signal shall be superimposed onto the NAC by the FACP, a remote power supply or an add-on synchronization module. Visual notification appliance circuits shall be programmed to be extinguished as described above. Visual notification appliance circuits throughout the site shall be activated by any alarm initiating device.
4. System Reset Button: The system reset button located on FACP's and remote annunciators in addition to resetting the fire alarm system and silencing or extinguishing notification appliances except for the sprinkler water flow appliances shall be programmed to reset analog and addressable smoke detectors, duct detectors, beam detectors and relays, addressable control modules and addressable relay modules used to interface to other systems and equipment. Each installed system reset button shall be programmed to operate as a "single point of reset" for the complete system.
5. Smoke Detector Maintenance Alert: Addressable smoke detectors shall be programmed with the capability of initiating a maintenance alert when any one detector becomes obscured by dust or any other contaminates at approximately 10 percent below the level of obstruction that would initiate an alarm.
6. Disabling Class Passing Signals: The relay or addressable relay module shall be programmed to disable the class passing signals during any alarm condition at the site. This relay or addressable module shall return to normal only after the system is reset.
7. Disabling Audio of a Public Address System: The relay or addressable relay module shall be programmed to mute the audio output of the associated public address system during any activation of an audible notification appliance circuit or a voice evacuation announcement. This or these relays shall automatically restore to normal upon the silencing of the audible NACs and the voice evacuation announcement.
8. UDACT: The FACP and the associated Universal Digital Alarm Communication Transmitter shall be programmed to transmit to the central monitoring station separate indications for General Alarm, Fire Sprinkler Water Flow Alarm, System Trouble and Supervisory Conditions. These indications shall be in addition to any indications initiated by the UDACT itself.
9. Voice Evacuation Panel: The NAC originating at, or the addressable control module controlled by the associated FACP that is controlling the

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EVAC panel shall be programmed to emulate the above paragraph “E” Audible Notification Appliance Circuits except that it shall be non-coded. Trouble conditions at the EVAC panel shall report back to the associated FACP via the controlling NAC or addressable control module or a separate addressable monitor module. Transformer taps at the EVAC speakers shall be selected to provide the proper balance of audio volume in larger and smaller areas. The message shall be programmed in a female voice in the English language as follows: A minimum of two but no more than three cycle sounding of an approximate 1000 Hz tone in the pattern of the NFPA required temporal code followed by: “May I have your attention please. May I have your attention please”. The fire alarm has been activated in the building. The fire alarm has been activated in the building. Please proceed to the nearest exit and leave the building.” The sounding of the temporal patterned signal followed by the indicated message shall repeat indefinitely until the controlling NAC is reset.

10. Power Failure Reporting Time Delay: Main and remote NAC power supplies shall be programmed to delay the reporting of a site AC power failure for a minimum of 6 hours.

D. Device Descriptors:

1. Descriptors shall enable responding personnel to identify the location of a fire quickly and accurately, and shall indicate the status of emergency equipment or fire safety functions that might affect the safety of occupants. The minimum required information for devices intended to report smoke, fire, or fire sprinklers water flow include, but may not be limited to: Building, floor (if multiple floors exist in the building), room or space description, and device type and digital address (Smoke detector, Heat detector, Fire sprinkler water flow switch, etc.)
 - a. Building: The building must always be included in the descriptor, even if there is only one building on the site. Additional building(s) may be added at a later date creating the possibility of confusion by similar designated spaces, such as “Work room” or “Staff restroom” if more than one building has these similar designated spaces. The building designation in the descriptor must be what the site-based personnel call the building. The building should be provided with signage to aid fire department personnel in the identification of the building.
 - b. Floor: In multi-floor buildings the floor designation (1st, 2nd, etc.) must be included in the descriptor.
 - c. Room Description: The room or space description must be unique. Using the same designation for multiple spaces, such as “Workroom”, “Counselor’s Office”, or “Men’s restroom”, etc. is not acceptable. If, during a project, the room numbers or the use of the room changes then the room or space descriptor must be changed to agree with the change. Proper signage should be

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provided for each space to aid fire department personnel in the identification of the room or space.

- d. Device Type, Address and Compass Designations: The device type and digital address must be included with the descriptor, such as smoke detector or heat detector, etc. Some systems provide this information automatically in the descriptor. Compass designations, (N, S, E, and W) are required in spaces such as corridors where there are multiple detectors and this information would be helpful to responding fire department personnel in locating the device reporting alarm. It is not necessary to include compass designations in smaller spaces where there are multiple detectors located in close proximity to each other.

E. ACCEPTABLE ABBREVIATIONS

Rm.- Room	Bldg.- Building	Smk. - Smoke
Corr.- Corridor	Lby- Lobby	Asst. - Assistant
Eng.- English	N – North	Off. - Office
Flr.- Floor	S – South	PE – Physical Education
Ht.- Heat	E – East	PM – Plant Manager
Lib.- Library	W – West	Det - Detector
Lkr. – Locker	Prin – Principal	Park – Parking
1 st - First	2 nd - Second	3 rd - Third

3.04 SYSTEM OPERATION

- A. Unless otherwise specified, but not limited to actuation of manual stations, smoke detectors, heat detectors, linear heat or smoke detectors, or water-flow switches shall cause the following operations to occur, refer to Attachment B:
1. Activate audible circuits.
 2. Actuate strobe units until the panel is reset or strobe circuit time-out.
 3. UL listed central station shall be notified via – Universal Digital Alarm Communicator Transmitter (UDACT).

3.05 TESTING

- A. A 48 hour notice shall be provided to the Project Inspector before final testing.

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- B. Testing of fire detection system shall be as required by the State Fire Marshal and local authorities having jurisdiction. Installer is responsible for identifying required testing, coordinating, scheduling, and conducting tests before Substantial Completion. Tests shall include the following:
1. Operation of signal-initiating devices (smoke detectors, heat detectors, pull stations etc.).
 2. Operation of indicating devices (alarm horns, alarm bells and alarm strobes).
 3. Operation of system features under normal operation.
 4. Operation of system supervisory features.
 5. Operation of system features on standby power, with primary power turned off.
 6. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 7. Close sprinkler system flow valves and verify proper supervisory alarm at the FACP.
 8. Verify activation of flow switches.
 9. Open initiating device circuits and verify that trouble signal actuates.
 10. Open signaling line circuits and verify that trouble signal actuates.
 11. Open and short notification appliance circuits and verify that trouble signal actuates.
 12. Open and short (wire only) network communications and verify that trouble signals are received at network annunciators or reporting terminals.
 13. Ground initiating device circuits and verify response of trouble signals.
 14. Ground signaling line circuit and verify response of trouble signals.
 15. Ground notification appliance circuit and verify response of trouble signals.
 16. Check alert tone to alarm notification devices.
 17. Check installation, supervision, and operation of intelligent smoke detectors.
 18. Alarm conditions that the system is required to detect shall be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
 19. When the system is equipped with optional features, consult the manufacturer manual to determine proper testing procedures.
 20. Central and Autonomous PA systems for muting during the sounding of the audible notification appliances and voice evacuation announcements.
 21. Disabling electronic tone or electromechanical bell class passing signals until system reset.

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- C. Upon completion of installation of fire alarm equipment, provide to the OAR a signed, written statement confirming that fire alarm equipment was installed in accordance with the Specifications, Shop Drawings, instructions and directions provided by the manufacturer.
- D. Demonstrate in presence of the Project Inspector that circuit and wiring tests are free of shorts and grounds and that installation performs as specified herein and within manufacturer's guidelines.
- E. Software Modifications:
 - 1. Provide the services of a factory trained and authorized technician to perform system software modification, upgrades or changes. Response time of the technician to the Project site shall not exceed 24 hours.
 - 2. Provide hardware, software, programming tools, and documentation necessary to modify the fire alarm network on the Project site. Modification includes: addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modification on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being provided.
- F. Complete the inspection and testing form as required by NFPA 72, and submit one copy of the completed form to the Architect and Project Inspector.

3.06 SERVICE MANUALS

- A. Deliver to OAR, three copies of the service manuals. Each manual shall include the following:
 - 1. Installation manuals, programming manuals and user manual if applicable for every control panel, control panel power supply, FACP input or output or relay or control module, auxiliary power supply, UDACT, remote NAC extender power supply, door holder power supplies, installed annunciators, initiating and indicating devices and addressable monitor, relay and control modules. Catalog cut sheets are not acceptable.
 - 2. A printed copy of the system configuration as programmed, including system labeling codes, and passwords.
 - 3. An electronic copy on compact disk of the system configuration program
 - 4. Final test report.
 - 5. Detailed explanation of the operation of the system.
 - 6. Instructions for routine maintenance.
 - 7. Detailed wiring diagram for the connection of relays, addressable monitor, and control or relay modules as applied in the interfacing of peripheral systems or equipment to the fire alarm system. Updated shop drawings shall include revisions made in the field via plan changes, RFIs, Field

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Change Directives, and any other construction change documents including interface details with ancillary systems.

8. An electronic copy (CD) of the posted site or fire alarm map in Auto-Cad and pdf formats.
9. Provide a CD ROM electronic copy of the updated system As-Built Drawings to the OAR, prepare this copy in the latest version of AutoCAD; along with the electronic copy provide a full size bond copy. Include one CD-ROM of the up-dated As-Built Drawings into each of the Service Manuals. CD and folded drawings shall be secured and inserted into the Service Manuals via a three-hole punched protective CD case and protective envelopes for the drawings.
10. Provide codes and passwords for fire alarm system at testing.

3.07 SPARE PARTS

The following new spare parts shall be furnished in unopened boxes:

1. Five percent spare pull stations including the associated monitor module (minimum one spare pull station per type).
2. Five percent spare smoke and heat detectors (minimum one spare smoke and heat detector per type).
3. Five percent spare audible devices (minimum one spare audible device per type).
4. Five percent spare strobe devices (minimum one spare strobe device per type).

3.08 SYSTEM USER AND MAINTENANCE PERSONNEL TRAINING

- A. Before Substantial Completion, provide one instruction period for the Project site based Owner operators and system users. The instruction period shall be scheduled and coordinated by the OAR.
- B. Training materials and required deliverables shall be submitted to the OAR.
 1. Prior to beginning the operational demonstration, notify Central monitoring Station that an instructional activity is beginning; inform them that it includes setting and resetting the system in test mode. After the demonstration is completed and the system restored, notify the Central Monitoring Station that the system has been restored and it is back on line for continuous monitoring.
- C. User Instruction and Training
 1. Before substantial completion and with a fully functional fire alarm system installed at the site, the contractor shall provide a minimum of four hours of user training for site based staff. The date and time for this training shall be coordinated by the project OAR.
- D. Instruction period training for site based staff shall consist of the following:

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1. Overview:

- a. Explain the fire system is “addressable” which means every device-smoke detector, heat detector, sprinkler water flow switch, manual pull station, etc. has a unique address or identity. This makes it possible to positively identify the exact device causing an alarm, trouble or supervisory condition.
- b. Explain the fire alarm control panel also controls the horns and strobes throughout the campus or building.
- c. Explain that the fire alarm system is interconnected to various other systems and equipment throughout the site such as:
 - 1) Heating and air conditioning equipment to turn off fans and close dampers to stop the spread of smoke throughout a building.
 - 2) The class passing signaling system to disable the bells or tones to not accidentally signal students and staff to return to the buildings.
- d. Explain the fire system has a battery backup in case of power failure and that it will continue to function for a minimum of 24 hours after a total power failure.
- e. Explain that the fire alarm system components and wiring are monitored to report a malfunction, damage or vandalism. When this occurs, a trouble indication will appear on the fire alarm annunciator and FACP and this indication will be transmitted to the central monitoring station.
- f. Explain that other equipment and systems are monitored for abnormal conditions such as the fire sprinkler water being turned off. When this occurs, a supervisory condition is created. A supervisory indication will appear on the fire alarm annunciator and FACP and this indication will be transmitted to the central monitoring station.
- g. Explain that the fire system in addition to notifying the occupants of a possible fire condition also transmits an alarm indication to the central monitoring station that will in turn notify and dispatch the local fire department to your site.

2. Basic:

- a. Hand out the SYSTEM OPERATION instructions to attendees.
- b. Point out the Fire Alarm Control Panel and have them observe the normal LED status (one green LED only should be on):
 - 1) GREEN = Normal.
 - 2) YELLOW = Trouble.
 - 3) RED = ALARM.

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- c. Have the attendees observe the LCD display that should be indicating a SYSTEM NORMAL message.
 - d. Point out the Fire Alarm System Annunciator and have attendees observe the LCD display that should be indicating a SYSTEM NORMAL message.
3. Operation and Demonstration:
- a. After putting the system or having someone put the system central station monitoring into the test mode demonstrate the following:
 - b. Activate a Manual Pull Station to demonstrate ALARM.
 - 1) Demonstrate audible and visual notification appliances and if installed the voice evacuation signal announcement.
 - 2) Demonstrate panel or annunciator sounder tone for ALARM.
 - 3) Have staff SILENCE system.
 - 4) Show LCD display and LED of alarm.
 - 5) Demonstrate and have staff reset the manual pull station.
 - 6) Have staff RESET fire system.
 - c. Activate Smoke Detector with canned smoke to demonstrate address identification:
 - 1) Have staff SILENCE system.
 - 2) Show LCD and display LED of ALARM.
 - 3) Have staff RESET fire system.
 - d. Remove Smoke Detector to demonstrate SYSTEM TROUBLE.
 - 1) Demonstrate panel or annunciator sounder tone for TROUBLE.
 - 2) Have staff SILENCE system.
 - 3) Show LCD display and LED of TROUBLE.
 - 4) Replace the smoke detector.
 - 5) Have staff RESET fire system.
 - e. Remove power to demonstrate function during power failure.
 - 1) Have staff SILENCE system.
 - 2) Show LCD display and LED of TROUBLE.
 - 3) Activate Manual Pull station to demonstrate audible or visual functions in power failure mode.
 - 4) Reset manual pull station.
 - 5) Reset fire system.

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- 6) If applicable, point out sprinkler riser and shut off valves.
- 7) Show location of a water flow switch.
- 8) Show location of a valve tamper switch.
- 9) Point out valves must always be OPEN or fully counter clock wise.
- 10) Point out PIV (Post Indicator Valves) if applicable.
- 11) Have water flow through the inspectors test valve and point out the ringing water flow bell.
- 12) After the horns are silenced by an assistant, show that the water flow bell is ringing continuously indicating water flow.
- 13) Have the assistant turn off the inspectors test valve to show that water flow alarm bell turns off.
- 14) Reset system.
- 15) Unlock and turn off a PIV or riser valve to show a supervisory condition.
- 16) Turn valve back on, lock the valve open and demonstrate the end of the indication of a supervisory condition.

4. Training documentation.

- a. Insure fire panel is reset and indicates normal and central station monitoring is taken off of the test mode.
- b. Have staff attendees sign off training sheet and provide a copy to the PROJECT INSPECTOR.

3.09 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.10 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

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SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Removal of vegetation, grass, grass roots, shrubs, tree stumps, trees, upturned stumps, weed growth, tree roots, brush, masonry, concrete, rubbish, debris and other materials.
2. Removal of concrete and bituminous surfaces.
3. Removal of existing fences and gates.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 2200 - Grading.
3. Section 31 2316 - Excavation and Fill for Pavement.
4. Section 31 2326 - Base Course.

1.02 SUBMITTALS

- A. Shop Drawings: Submit site plan indicating extent of site clearing.

1.03 QUALITY ASSURANCE

- A. Comply with Standard Specifications for Public Works Construction, current edition, as a minimum requirement.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 TREE AND STUMP REMOVAL

- A. Remove trees and stumps indicated or required to be removed. Remove trees, together with bulk of roots, to a minimum depth of 4 feet below required grade, and within a radius of approximately 7 feet beyond perimeter of trunk at grade.
- B. Fill and compact excavation from tree and stump removal. Fill in 6 inch layers, each compacted to 90 percent of maximum density in accordance with ASTM D1557.
1. Back filling shall not commence until the excavation is inspected and tested.

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3.02 CONCRETE AND BITUMINOUS SURFACING REMOVAL

- A. Break up and completely remove existing concrete surfacing, curbs, gutters, walks and bituminous surfacing to indicated limits. Cutting shall be performed to a neat and even line with proper tools or a concrete cutting saw. Minimum depth of cut shall be 1 1/2-inch, unless otherwise indicated. Remove concrete broken beyond the indicated limits to the nearest joint or score line and replace with new concrete to match existing.

3.03 FENCING

- A. Existing fences scheduled to remain may be removed to facilitate the Work, provided they are installed to their original condition in accordance with requirements of Section 32 3113 - Chain Link Fences and Gates.
- B. Fencing indicated to be removed and not reinstalled shall be completely removed, including footings. Fill and compact excavations.
- C. Install chain link fencing indicated to be relocated or reset in accordance with applicable requirements specified under Section 32 3113 - Chain Link Fences and Gates.

3.04 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 31 22 00 - GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 1000 - Site Clearing.
3. Section 31 2316 - Excavation and Fill for Pavement.
4. Section 31 2326 - Base Course.

1.02 PROJECT REQUIREMENTS

A. General:

1. Fees: Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.
4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on public buried utilities and pipelines. Retain the services of an underground utility locator for on-site utilities.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials shall conform to requirements specified in this and related sections.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect and maintain installed stakes until their removal is required for the Work. Provide replacement grade or location stakes lost or disturbed.

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- B. Install grade stakes and compare to indicated grades. If discrepancies are found between existing grades and grades indicated on Drawings, do not proceed until discrepancies are resolved.

3.02 ROUGH AND FINE GRADING

- A. Rough grade area sufficiently high to require cutting by fine grading:
1. Grade area for bituminous surfacing and other paving to the indicated grades, equal to the section of the indicated base and pavement.
 2. Slope banks to required finish grades as cut progresses or leave cuts full and finish grade by mechanical equipment to provide grades and soil densities indicated on the Drawings.
 3. Rough grade, fill and compact banks beyond indicated finish grades. Finish grade banks and slopes to indicated grades and specified soil densities.
 4. Grade Only Areas: In areas not indicated to receive pavement, rough grade to approximate finish grades and then scarify, moisten and roll to obtain required density and indicated finish grades.
 5. Tolerances: Finish grades shall be within a tolerance of 0.05 inch per foot above or below grades indicated. Provide an average grade as indicated.
- B. Base or Subgrade:
1. After subgrade has been constructed to approximate required grades, scarify to a depth of at least 6 inches:
 - a. After scarifying, process loosened material to a finely divided condition and adjust moisture content to optimum condition by addition of water, addition and blending of dry suitable material, or by drying of existing material.
 - b. Subgrade material shall be compacted by tamping, sheepfoot rollers or pneumatic tire rollers. Required relative compaction shall be **[90]** percent minimum for the top 6 inches below subgrade.
 - c. Install base course in accordance with Section 31 2326 - Base Course.
 2. Tolerance of completed grades of base or subgrade shall not vary more than 0.03 inch per foot from grades indicated. Provide an average grade as indicated.

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3.03 SHORING

- A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.
- B. Design and Calculations: Provide in accordance with requirement of CalOHSA.
- C. Remove shoring upon completion of the Work of this section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.04 EXCESS MATERIAL DISPOSAL

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

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SECTION 31 23 16 - EXCAVATION AND FILL FOR PAVING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Excavating, backfill, and compacting for paved areas.
 - 2. Installation of fill materials.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 31 1000 - Site Clearing.
 - 3. Section 31 2200 - Grading.
 - 4. Section 32 2326 - Base Course.
 - 5. Section 32 1216 - Asphalt Paving.
 - 6. Section 32 1313 - Site Concrete Work.

1.02 PROJECT REQUIREMENTS

- A. Import and Export of Earth Materials:
 - 1. Fees: Pay as required by authorities having jurisdiction over the area.
 - 2. Bonds: Post as required by authorities having jurisdiction over the area.
 - 3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 QUALITY ASSURANCE

- A. Comply with Standard Specifications for Public Works Construction, current edition, except as modified herein.
- B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 4524 - Environmental Import/Export Materials Testing.

1.04 TESTING

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- A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of OWNER.
- B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.05 of this Section.

1.05 PROJECT CONDITIONS

- A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.01 BASE MATERIALS

- A. Concrete Slabs On Grade: Provide "Crushed Aggregate Base "as specified in the Standard Specifications for Public Works Construction, Section 200: "Rock Materials," with $\frac{3}{4}$ inch maximum size aggregates. Provide 3-inch thick base, unless noted otherwise.
- B. Bituminous Surfacing: As indicated on Drawings and specified in Section 31 2326 - Base Course.

2.02 FILL AND BACKFILL MATERIALS

- A. Fill and backfill materials shall be previously excavated materials or imported fill material, free of clods and stones larger than 3-inch, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.
- B. Fill material exhibiting a wide variation in consistency and moisture content shall be blended or aerated to stabilize and upgrade the material.
- C. Imported Fill Material:
 - 1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.
 - 2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than 2 percent from air dry to optimum moisture content and not more than 6 percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

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- D. Brick rubble and broken concrete originating from the Project site shall be legally disposed of off the Project site. No such materials shall be imported from outside the Project site.
- E. Permeable Backfill:
1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size:	Percentage Passing:
3/4 inch (19mm)	100
3/8 inch (10mm)	80 to 100
No. 100	0 to 8
No. 200	0 to 3
 2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.
 3. Provided backing for weep holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.
 4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system, Miradrain by Mirafi, Inc., or equal, may be provided if reviewed and approved by the ARCHITECT.

PART 3 - EXECUTION

3.01 GENERAL

- A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.
- B. Clear the Project site as indicated in Section 31 1000 - Site Clearing.

3.02 PROTECTION

- A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.
- B. Protect adjacent existing improvements including landscaping against damage.

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3.03 EXISTING UTILITY LINES

- A. Protect existing utility lines from damage or displacement.
- B. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of 2 feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.

3.04 EXCAVATION

- A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.

3.05 FILL

- A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.
- B. Provide fill materials as specified in Part 2 - Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.
- C. In addition to the requirements of this Section, import and/or exported materials shall comply with the requirements of Section 01 4524 - Environmental Import/Export Materials Testing.
- D. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.
- E. The Geotechnical Engineer will submit samples to a DSA approved independent approved testing laboratory for testing.
- F. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will obtain both the initial and additional samples from the identified site and will submit samples to the approved independent testing laboratory for testing.
- G. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.
- H. The independent approved testing laboratory will perform the required tests and report results of tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, OAR, DSA, CONTRACTOR, and others

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as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, CBC, and the DSA. Upon completion of the Work of this Section, the independent testing laboratory and Geotechnical Engineer shall submit a verified report to the DSA as required by CBC.

- I. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.
- J. Upon completion of import operations, provide the OAR a certification statement attesting that imported material has been obtained from the identified source site.

3.06 INSTALLATION OF MATERIALS

- A. Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the Geotechnical Engineer, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but no more than 1 in 20. Provide adequate drainage at all times during construction of the Work of this Section.

3.07 COMPACTING

- A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated and directed compaction equipment.
- B. Unless otherwise indicated, compact each layer of earth fill to a relative compaction of at least 90 percent.
- C. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each compacted layer before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

- A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.
- B. The Geotechnical Engineer will sample imported fill materials from their designated source before delivery to the Project site.
- C. Installation of backfill will be observed by the Geotechnical Engineer.
- D. The Geotechnical Engineer will inspect and test excavation Work before the installation of fill and/or other materials.

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- E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

3.09 PROTECTION

- A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 31 23 26 - BASE COURSE

PART 1 - GENERAL

A. Related Sections

1. 31 23 00: Excavation and Backfill
2. 32 12 16: Asphalt Paving
3. 32 12 12: Site Concrete Work

B. Reference Standards

1. Conform to Section 200,2.2 of the Standard Specifications for Public Works Construction.
2. Conform to site specific geotechnical report for specified thickness.

PART 2 – PRODUCTS

A. Base Material

1. Use crushed aggregate base (CAB). Crushed miscellaneous base is not acceptable.
2. Crushed Aggregate Base Material shall conform to with the requirements of Standard Specifications for Public Works Construction, Section 200 – Rock Materials.
3. All import material must meet Department of Toxic Substance Control (DTSC) requirements. The District has experience with a few of the larger facilities for the import of construction materials that have been tested and accepted. For a current list of those facilities contact the District.

PART 3 – EXECUTION

- A. Install aggregate base course material in layers not exceeding 4-inches.
- B. Compact per the requirements of the soils report and drawings, or 95 percent if not noted.

END OF SECTION

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SECTION 32 13 13 – SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: On-site concrete work:
 - 1. Portland cement concrete pavement, driveways, curbs, gutters and mowing strips.
 - 2. Ramps and stairs on grade.
 - 3. Footings for fence posts, bollards, flagpoles, shade structures, light standards and athletic and playground equipment.
 - 4. Pipe encasements, thrust blocks, and equipment pads.
 - 5. Retaining walls, planter walls and concrete benches.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 31 2200 – Grading.
 - 3. Section 31 2316 - Excavation and Fill for Pavement.
 - 4. Section 31 2326 - Base Course.
 - 5. Section 32 1216 - Asphalt Paving.

1.02 REFERENCES

- A. Structural work, such as retaining walls, planter walls, cast-in-place benches, equipment pads, and footings for playground equipment, fences, walls, shade structures and flagpoles shall conform to the following Sections:
 - 1. Section 03 3000 Cast-in-Place Concrete.
- B. Flatwork, such as walkways, driveways, ramps and steps on grade, swales, curbs, mow strips and utility related concrete, conform to:
 - 1. Standard Specifications for Public Works Construction, The “Greenbook”, except reclaimed aggregates and processed miscellaneous base are not allowed.
- C. Imported or exported earthwork shall conform to Section 01 4524 Environmental Import / Export Materials Testing.

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D. National Ready Mixed Concrete Association (NRMCA):

1. Checklist for the Concrete Pre-Construction Conference.

1.03 QUALITY ASSURANCE

A. Source Limitations for Exposed Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide concrete of consistent quality in appearance and physical properties. Secure material required for the duration of the project as needed to ensure consistent quality in appearance.

B. Pre-Installation Conference:

1. CONTRACTOR shall coordinate and conduct pre-installation conference in conformance to Section 01 3119 Project Meetings.
2. CONTRACTOR shall use the NRMCA "Checklist for the Concrete Pre-Construction Conference" as the meeting agenda.

C. Mockup:

1. Build 8 feet by 8 feet mockups of full-thickness sections of concrete paving using processes and techniques intended for use on permanent work, including curing procedures.
2. Build mockups to demonstrate typical joints; surface finishes and standard of workmanship.
3. Obtain ARCHITECT's approval of mockup before proceeding with work of this Section.
4. Mockup shall remain through completion of the work for use as a quality standard for finished work.
5. Remove mockup when directed by the OAR.

D. Field applied primers, paintings, sealers, sealants, caulking, leveling and patching compounds, crack/joint repair compounds adhesives and similar products shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

1.04 SUBMITTALS

A. Flatwork: Submit mix design in conformance to the Greenbook.

B. Shop Drawings: Submit drawings indicating the locations of concrete joints, including construction joints, expansion joints, isolation joints, and contraction joints.

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- C. Submit concrete Sample of each specified color.
- D. Submit full range of manufacturer's standard and custom range colors and products for ARCHITECT's review and selection.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Store cement and aggregate materials so to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.
- B. Packaged materials shall bear the manufacturers and brand name label and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.
- C. Avoid exposure of reinforcing steel bars, wire, and wire fabric to dirt, moisture or conditions harmful to reinforcing.
- D. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated by size and shape.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Work: Conform to the applicable requirements of the following Sections, except as otherwise specified:
 - 1. Section 03 1000 Concrete Forming.
 - 2. Section 03 2000 Concrete Reinforcing.
 - 3. Section 03 3000 Cast-in-Place Concrete.
 - 4. Section 07 9200 Joint Sealants.
- B. Flatwork: Conform to the applicable requirements of the Greenbook, Section 201, except as follows:
 - 1. Water/cement ratio for concrete flatwork shall be 0.50 maximum.
 - 2. Base course shall conform to Section 32 3226 Base Course.
 - 3. Reclaimed concrete material shall not be used.

PART 3 - EXECUTION

3.01 EXAMINATION

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- A. Verify that gradients and elevations of base are correct. Maintain subgrade clean and in a smooth, compacted condition until the concrete is placed.
- B. Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. Earth surface shall be kept moist by frequent sprinkling up to the time of placing concrete.

3.02 CONSTRUCTION OF FORMS

- A. Flatwork Forming: Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 4 stakes per form placed at intervals not to exceed two feet. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms.
- B. Wall Formwork: Forms shall be constructed to conform to final concrete shape, lines and dimensions of members required by Drawings and Specifications. Forms shall be sufficiently tight to prevent leakage of concrete and properly braced or tied together to maintain position and shape.

3.03 STEEL REINFORCEMENT INSTALLATION

- A. Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted.
- B. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- C. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces, and lace splices with wire.
- D. Clean reinforcement of loose rust and mill scale, earth, or bond-reducing materials.

3.04 PREPARATION FOR CONCRETE PLACEMENT

- A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.
- B. Do not place concrete until forms, reinforcement, pipe, conduits, outlet boxes, anchors, sleeves, bolts, and other embedded materials are securely fastened in place. Maintain a minimum of two inches clearance between said items and any part of the concrete reinforcement.
- C. Adjust pull boxes, meter boxes, valve covers and manholes to proposed finish grade prior to placement of concrete. Anchor bolts shall be accurately set and maintained in position by templates while being embedded in concrete.

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- D. Clean thoroughly the surfaces of metalwork to be in contact with concrete, remove dirt, grease, loose scale and rust, grout, mortar, and other foreign substances before the concrete is placed.
- E. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

3.05 CONCRETE PLACEMENT

- A. Place, compact, screed, float and trowel concrete as indicated in Section 03 3000 Cast-in-Place Concrete.
- B. Finish: After straight edging, when most of the water sheen has disappeared and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.
 - 1. Provide medium broom finish on surfaces up to six percent slope by striating surface 1/32 to 3/64 inch deep with a soft bristle broom across concrete surface to provide a uniform fine line texture.
 - 2. Provide heavy broom finish on surfaces over six percent by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom.

3.06 JOINTS

- A. Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated. Align curb, gutter, and sidewalk joints.
- B. Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated on the Drawings.
 - 2. Provide tie bars at sides of paving strips where indicated on the Drawings
 - 3. Butt Joints: Use bonding agent or epoxy-bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

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- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated on the Drawings.
- D. Expansion Joints:
1. Provide premolded joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together. Extend expansion joint fillers full-width and depth of joint, and 1/4" below finished surface where joint filler is indicated. If no joint sealer is indicated place top of premolded joint filler flush with top of concrete or curb.
 2. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints to a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Remove grooving-tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- F. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Remove edging-tool marks on concrete surfaces.
- G. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting, exposing the aggregate. The hardened surface shall be cleaned of latent foreign material and washed clean, prior to the application of an epoxy bonding agent.

3.07 STAIRS AND RAMPS

- A. Install support post sleeves into the perimeter concrete curbing during the installation process of the curbing. Sleeves shall be three-inch diameter, schedule 40 PVC with a cap solvent welded to the bottom of the sleeve. Drill a half-inch weep hole on the bottom of the cap. Sleeve and cap shall be Nibco products or approved equal. Sleeves

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shall be embedded into concrete a minimum of nine inches and spaced at a maximum of four feet, or as indicated on the Drawings. Fill sleeve with non-shrink grout Quickcrete #1585-01 when setting posts. Provide control joints into the concrete on both sides for each post.

3.08 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

- A. Formed Curb and Gutter: Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Finish curve shaped gutters with a standard curb mule or concrete slipformed curb paving equipment.
- B. Concrete Finishing: Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter to grade with a wood float.
- C. Surface and Thickness Tolerances: Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.09 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project Site.

3.10 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

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SECTION 32 31 19 - DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Decorative steel fences.
 - 2. Swing gates.
- B. Related Sections:
 - 1. Refer to Drawings for gate hardware not specified in this Section.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fencing and gates.
 - 1. Include plans, elevations, sections, gate locations, post spacing, and attachment details.
- C. Samples: For each fence material and for each color specified.
 - 1. Provide Samples 12 inches in length for linear materials.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. 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:
 - 1. Ametco Manufacturing Corp.
 - 2. A&T Iron Works, Inc.
 - 3. Fortress Building Products.
 - 4. Omega II Fence Systems.

HMC Architects
3361008101

DECORATIVE METAL FENCES AND GATES
32 31 19 - 1

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2.02 PERFORMANCE REQUIREMENTS

- A. Wind Loading:
1. Fence Height: 0 to 15 feet.
 2. Wind Exposure Category: B .
 3. Design Wind Speed: 110 mph.
 4. Design Wind Pressure: 20 psf.

2.03 DECORATIVE STEEL FENCES

- A. Decorative Steel Fences: Fences made from steel tubing and shapes, hot-dip galvanized.
- B. Posts: Square steel tubing.
1. Line Posts: As indicated on Drawings.
 2. End and Corner Posts: with As indicated on Drawings.
 3. Swing Gate Posts: As indicated on Drawings.
- C. Post Caps: Formed from steel sheet and hot-dip galvanized after forming.
- D. Rails:
1. Steel Tube Rails: Steel tubing as indicated on Drawings.
- E. Pickets: As indicated on Drawings.
1. Terminate tops of pickets at top rail for flush top appearance.
 2. Picket Spacing: As indicated on Drawings.
- F. Fasteners: Stainless-steel carriage bolts and tamperproof nuts.
- G. Fabrication: Assemble fences into sections by welding pickets to rails.
1. Fabricate sections with clips welded to rails for field fastening to posts.
 2. Drill posts and clips for fasteners before finishing to maximum extent possible.
- H. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- I. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
1. Hot-dip galvanize posts and rails.
 2. Hot-dip galvanize rail and picket assemblies after fabrication.
- J. Finish for Metallic-Coated-Steel Items: Powder coating.

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2.04 SWING GATES

- A. Gate Configuration: Double leaf.
- B. Gate Frame Height: As indicated on Drawings.
- C. Gate Opening Width: As indicated on Drawings.
- D. Galvanized-Steel Frames and Bracing: Fabricate members from tubes as indicated on Drawings from steel sheet and hot-dip galvanize after fabrication.
- E. Frame Corner Construction: Welded.
- F. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
- G. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- H. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
- I. Finish for Metallic-Coated-Steel Items: Powder coating.

2.05 STEEL AND IRON

- A. Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.
- C. Tubing: ASTM A500/A500M, cold-formed steel tubing.
- D. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 50, with G90 coating.
- E. Aluminum-Zinc, Alloy-Coated Steel Sheet: ASTM A792/A792M, structural quality, Grade 50, with AZ60 coating.

2.06 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 32 13 13 "Site Concrete Work" with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch maximum aggregate size or

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dry, packaged, normal-weight concrete mix complying with ASTM C387/C387M mixed with potable water according to manufacturer's written instructions.

- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M and specifically recommended by manufacturer for exterior applications.

2.07 METALLIC-COATED-STEEL FINISHES

- A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a zinc-phosphate conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- B. Powder Coating: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat finish consisting of zinc-rich epoxy prime coat and TGIC polyester topcoat to a minimum dry film thickness of 2 mils. Comply with coating manufacturer's written instructions to achieve a minimum total dry film thickness of 4 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.
 - 2. Comply with surface finish testing requirements in ASTM F2408.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

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3.03 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

3.04 DEMONSTRATION

- A. Train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION