

Newport Beach Fire Station No. 1 & Library

110 E. Balboa Blvd.
Newport Beach, California

Issued for Construction Specifications – February 5, 2026



Newport Beach Public Works Dept.
City Contract No. C-8865-1

coar

SECTION 00 01 07

SEALS PAGE

Project Title:	Newport Beach Fire Station No. 1 and Library		
Project Location:	110 E Balboa Blvd.		
Project Number:	C-8865-1		
Architect/Engineer:	COAR Design Group, 9640 Granite Ridge Dr, Suite 130, San Diego, CA 92123		

SEALS, SIGNATURES, AND DATES OF DESIGN PROFESSIONALS OF RECORD			
<i>(Seal and Signature)</i>	Architect Professional Certification: I hereby certify that these documents were prepared or approved by me and that I am a duly registered Architect. <u>Jeffrey A. Katz</u> <i>(Print Consultant Name)</i> C018223 License No. _____ Expiration Date	<i>(Seal and Signature)</i>	Civil Engineer Professional Certification: I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer. <u>JOHN PAUL PRINCE</u> <i>(Print Consultant Name)</i> C72279 License No. _____ Expiration Date
<i>(Seal and Signature)</i>	Structural Engineer Professional Certification: I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer. <u>LUKE S. WILSON</u> <i>(Print Consultant Name)</i> 5933 License No. _____ Expiration Date	<i>(Seal and Signature)</i>	Electrical Engineer Professional Certification: I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer. <u>ANTON NATHANSON</u> <i>(Print Consultant Name)</i> E21090 License No. 03/31/27 Expiration Date
<i>(Seal and Signature)</i>	Mechanical Engineer Professional Certification: I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer. <u>DOUGLAS R. ISAAKS</u> <i>(Print Consultant Name)</i> 30090 License No. 09/30/26 Expiration Date	<i>(Seal and Signature)</i>	Fire-Protection Engineer Professional Certification: I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer. _____ <i>(Print Consultant Name)</i> License No. _____ Expiration Date

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SECTION 01 10 00 SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Newport Beach Fire Station No.1 and Library.
- B. Project Address: 110 E Balboa Blvd. Newport Beach, CA 92661
- C. Owner's Name: City of Newport Beach.
- D. Architect's Name: COAR Design Group.
- E. The Project consists of the construction of a new Fire Station and Library on the site of the building currently housing the Fire Station and Library

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price.

1.03 DESCRIPTION OF WORK

- A. Scope of demolition and removal work is indicated on drawings.
- B. Remove the entire building, including operational mechanical and electrical work and finishes:
 - 1. Site Utilities will be reconfigured for use in the new design..
 - 2. Some concrete, including curb and gutter to remain in place.

1.04 WORK BY OWNER

- A. Existing Building Demolition: Owner will remove and relocate all items not intended for demolition of the existing structure on site.

1.05 OWNER OCCUPANCY

- A. Owner intends to occupy the Project by the date stated in the Agreement as the contract completion date.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disruption to the adjacent community.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Do not obstruct roadways, sidewalks, or other public ways without permit.
- C. Time Restrictions:
 - 1. Limit conduct of especially noisy exterior work to the hours of 8:00 AM to 5:00 PM.
- D. Utility Outages and Shutdown:
 - 1. Prevent accidental disruption of utility services to other businesses and homes near this site. Provide 48 hour notice to the surrounding residents if a necessary shut down is required.

1.07 RELATED SECTIONS

- A. Unless otherwise noted, provisions of the sections listed below apply to every contract. Specific items of work listed under individual contract descriptions constitute exceptions.
- B. Section 01 20 00 - Price and Payment Procedures.
- C. Section 01 25 00 - Substitution Procedures.
- D. Section 01 30 00 - Administrative Requirements.

- E. Section 01 32 16 - Construction Progress Schedule.
- F. Section 01 35 53 - Security Procedures.
- G. Section 01 40 00 - Quality Requirements.
- H. Section 01 50 00 - Temporary Facilities and Controls.
- I. Section 01 55 00 - Vehicular Access and Parking.
- J. Section 01 58 13 - Temporary Project Signage.
- K. Section 01 60 00 - Product Requirements.
- L. Section 01 70 00 - Execution and Closeout Requirements.
- M. Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 REFERENCE STANDARDS

- A. AIA G702 - Application and Certificate for Payment; 1992.
- B. AIA G703 - Continuation Sheet; 1992.

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Submit one electronic and three hard-copies of each Application for Payment.
- H. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 30 00.
 - 2. Construction progress schedule, revised and current as specified in Section 01 30 00.
 - 3. Current construction photographs including all on-site and off-site stored products.
 - 4. Partial release of liens from major subcontractors and vendors.
 - 5. Affidavits attesting to off-site stored products and their value.

1.05 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
 - C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within ____ days.
 - D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.
 - E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
 - G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
 - H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- 1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 25 00
SUBSTITUTION PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- B. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- C. Section 01 78 00-Closeout Submittals

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - c. Price and savings to the Owner..
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.
 - 3. Conditions: Architect will consider Contractor's request for substitution during the bidding process only when the following conditions are satisfied:
 - 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. Requested substitution does not require extensive revisions to the Contract Documents.
 - b. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - c. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Substitutions will only be considered during the bidding process.
- B. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 2. Agrees to provide the same warranty for the substitution as for the specified product.
 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly any non-compliant characteristics.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 4) Description of Substitution.
 - 5) Reason why the specified item cannot be provided.
 - 6) Differences between proposed substitution and specified item.
 - 7) Description of how proposed substitution affects other parts of work.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Sustainable design features.
 - 6) Warranties.
 - 7) Other salient features and requirements.
 - 8) Include, as appropriate or requested, the following types of documentation:
 - (a) Product Data:
 - (b) Samples.
 - (c) Certificates, test, reports or similar qualification data.
 - (d) Drawings, when required to show impact on adjacent construction elements.
 - d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- E. Limit each request to a single proposed substitution item.
1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.03 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION

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SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Web-based project software service.
- C. Electronic document submittal service.
- D. Preconstruction meeting.
- E. Site mobilization meeting.
- F. Progress meetings.
- G. Construction progress schedule.
- H. Contractor's daily reports.
- I. Progress photographs.
- J. Coordination drawings.
- K. Submittals for review, information, and project closeout.
- L. Change Directives.
- M. Requests for Information (RFI) procedures.
- N. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: General product requirements.
- B. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Make the following types of submittals to Architect:
 - 1. Requests for Information (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WEB-BASED PROJECT SOFTWARE SERVICE

- A. Autodesk Construction Cloud: Owner to provide, administer, and use Autodesk web-based project software to host and manage project communication and documentation.
 - 1. Include, at minimum, the following features:

- a. Project directory, including Owner, Contractor, subcontractors, Architect, Architect's consultants, and other entities involved in the project. Include names of contact persons and contact information for each entity.
- b. Access control for each entity and for each workflow process to determine each entity's digital rights to create, modify, view, and print documents.
- c. Workflow planning, allowing customization of workflow for each project entity.
- d. Creation, logging, tracking, and notification for project communications.
- e. Tracking of project documentation statuses in real time, including timestamped response log.
 - 1) Contractor shall review and apply electronic stamp certifying that each document complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
 - 2) Architect / Engineer review comments will be made available on the Autodesk Construction platform for downloading. Contractor will receive email notice of completed review.
- f. Procedures for viewing PDFs or similar file formats, allowing markups by each entity.
 - 1) Use Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other compatible PDF review software for applying electronic stamps and comments.
- g. Provide security features to lock markups against changes once submitted.
- h. Processing and tracking of payment applications.
- i. Processing and tracking of contract modifications.
- j. Creation and distribution of meeting minutes.
- k. Document management for drawings, specifications, and coordination drawings, including revision control.
- l. Management of construction progress photographs.
- m. Creation of data analytics reports.
- n. Creation and export of editable logs for software functions. Owner, Architect, and Architect's consultants will have rights and ability to download logs when required.
- 2. Cost: Owner pays cost of service and controls the process .
- 3. Comply with the software service's current published licensing agreements.
- 4. Training: At Contractor's option, training is available from Autodesk Construction regarding use of platform's training modules.
- 5. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
- 6. The electronic submittal process is not intended for color samples, color charts, or physical material samples. However, photos and/or transmittals for each shall be uploaded for design team response.
- 7. Distribution of reviewed submittals and RFI to subcontractors and suppliers is the responsibility of the Contractor.
- 8. Project Closeout: Architect determines when to terminate the software service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.

3. Distribution of Contract Documents.
 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Submission of initial Submittal schedule.
 6. Designation of personnel representing the parties to Contract from the Owner, Architect and Contractor.
 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 8. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

- A. Schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. Agenda:
1. Use of premises by Owner and Contractor.
 2. Owner's requirements.
 3. Construction facilities and controls provided by Contractor.
 4. Temporary utilities provided by Contractor.
 5. Survey and layout.
 6. Security and housekeeping procedures.
 7. Schedules.
 8. Application for payment procedures.
 9. Procedures for testing.
 10. Procedures for maintaining record documents.
 11. Requirements for start-up of equipment.
 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- D. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.

5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Review of off-site fabrication and delivery schedules.
 8. Maintenance of construction schedule.
 9. Corrective measures to regain projected schedules.
 10. Progress during succeeding work period.
 11. Coordination of projected progress.
 12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.
 14. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

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

3.06 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel. Reports should be short and precise.
- B. Transmit reports electronically to Owner and Architect at weekly intervals.
- C. Prepare the report with the following information:
 1. Date.
 2. High and low temperatures, and general weather conditions.
 3. List of subcontractors at Project site.
 - a. Approximate count of personnel at Project site.
 - b. Include a breakdown for supervisors, laborers, and others.
 4. Material deliveries.
 5. Safety, environmental, or industrial relations incidents.
 6. Meetings and significant decisions.
 7. Unusual events (submit a separate special report).
 8. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
 12. Change Orders received and implemented.
 13. Testing and/or inspections performed.
 14. List of verbal instruction given by Owner and/or Architect.
 15. Signature of Contractor's authorized representative.

3.07 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files to be included with payment application, not more than 3 days old..
- D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- E. In addition to periodic, recurring views from the same vantage point, take photographs of each of the following events:
 - 1. Completion of site clearing.
 - 2. Excavations in progress.
 - 3. Foundations in progress and upon completion.
 - 4. Structural framing in progress and upon completion.
 - 5. Enclosure of building, upon completion.
 - 6. Final completion, including site work.
- F. Take photographs as evidence of existing project conditions as follows:
 - 1. Interior views: open wall and ceiling with all systems in view.
 - 2. Interior views: same locations after walls and ceilings are closed in.
 - 3. Exterior views: wide angle as well as close-up views
 - 4. Interior or Exterior views: difficult or controversial locations.
- G. Views:
 - 1. Provide drone photographs from four cardinal views at regular intervals until date of Substantial Completion.
 - 2. Consult with Architect for instructions on views required.
 - 3. Provide factual presentation.
 - 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
 - 5. Point of View Sketch: Provide sketch identifying point of view of each photograph.
- H. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: through Project Management Software in an easily downloadable format
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
 - 4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with location and file name; one PDF file per submittal.
 - 5. Hard Copy: Printed color hardcopy of PDF file and point of view sketch.

3.08 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.

3.09 CHANGE DIRECTIVES

- A. Owner or Architect driven changes to the design that affect the Contract Time or Contract Sum.
 - 1. Upon receipt of a Change Directive from the Owner or Architect, Contractor is responsible for providing the cost of that change to the Owner within 10 working days.
 - 2. Contractor is responsible for the delay if not received within that timeline.

3.10 REQUESTS FOR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:

1. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 2. Prepare in a format and with content acceptable to Owner.
 3. Combine RFI and its attachments into a single electronic file.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 2. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
 3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 4. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of Improper or Frivolous RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Architect's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date, and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 1. Indicate current status of every RFI. Update log promptly and on a regular basis.

2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
 5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to Contractor within ten (10) working days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. If a change to Contract Sum or Contract Time is determined by the Contractor, a written response to the RFI must be made within ten (10) working days upon receiving that response from the Architect or Engineer, and must include documentation on the cost and schedule impact.
 2. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 3. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 4. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 5. Notify Architect within five (5) working days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.11 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
1. Coordinate with Contractor's construction schedule and schedule of values.
 2. Format schedule to allow tracking of status of submittals throughout duration of construction.
 3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.12 SUBMITTALS FOR REVIEW

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

- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.13 SUBMITTALS FOR INFORMATION

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

3.14 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Final Property Survey.
- E. Submit for Owner's benefit during and after project completion.

3.15 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a separate transmittal for each item.
 - 2. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 - 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 - 6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Deliver submittals to Architect at business address.
 - 7. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow ten (10) working days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional five (5) working days.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.

8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 9. Provide space for Contractor and Architect review stamps.
 10. When revised for resubmission, identify all changes made since previous submission.
 11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 13. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Submit concurrently with related shop drawing submittal.
 4. Submit sustainable design reporting submittals under separate cover.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.16 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "No Exceptions Taken", or language with same legal meaning.
 - b. "Make Corrections Noted", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - 2) Non-responsive resubmittals may be rejected.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.

END OF SECTION

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SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

- A. Section 01 10 00 - Summary
- B. Section 01 20 00 - Price and Payment Procedures
- C. Section 01 30 00 - Administrative Requirements

1.03 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. Within 20 days after review of preliminary schedule, submit complete schedule for review.
- C. Submit updated schedule with each Application for Payment.
- D. Maintain schedule on electronic Project Management site and update weekly for use in Project meetings.

1.04 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules to define critical portions of the entire schedule.
- E. Include required coordination meetings in schedule.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- G. Provide sub-schedule of lead times for critical path products and materials, including submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect, including decision dates for selection of finishes.
- H. Indicate delivery dates for owner-furnished products.
- I. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.
- J. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.

- B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.

3.05 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

**SECTION 01 35 10
SUSTAINABILITY (CALGREEN) REQUIREMENTS**

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- B. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- C. NSF/ANSI 140 - Sustainability Assessment for Carpet; 2019.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

- A. This Section includes general requirements and procedures for compliance with certain California Green Building Standards Code. The California Green Building Code is Part 11 of twelve parts of the official compilation and publication of the adoption, amendment and repeal of the building regulations to the California Code of Regulations, Title 24, also referred to as the California Building Standards Code.
 - 1. This code contains both mandatory and voluntary green building measures. Mandatory and voluntary measures are identified in the appropriate application checklist contained in this code. Mandatory measures as outlined in the California Green Building Standards Code are a requirement of this contract. Voluntary measures are not required as a part of this contract.
 - 2. Voluntary Tier 1 and Tier 2 measures are not required as part of the scope of work of this contract.
- B. Related Sections include the following:
 - 1. Divisions 1 through 16 Sections for CALGreen requirements specific to the Work of each of those Sections. These requirements may or may not include reference to CALGreen.

1.04 DEFINITIONS

- A. CalGreen: California Green Building Standards Code
- B. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).
 - 1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
 - 2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

1.05 SUBMITTALS

- A. General: Comply with additional CALGreen submittal requirements included in other sections of the Specifications.
- B. Cal Green submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, the single set of copies to verify compliance with indicated CALGreen requirements is acceptable unless noted otherwise.
- C. Verification: Documentation of conformance for applicable green building measures shall be provided to the enforcing agency. Alternate methods of documentation shall be acceptable when the enforcing agency finds that the proposed alternate documentation is satisfactory to demonstrate substantial conformance with the intent of the proposed green building measure.

- D. CALGreen Documentation required: Provide preliminary submittals within seven days of date established for commencement of the Work indicating how the following requirements will be met.
1. 5.106.1 Storm Water Pollution Prevention plan.
 2. 5.408.1 Construction waste diversion: Establish a construction waste management plan for the diverted materials that meets or exceeds the local construction and demolition waste management ordinance, whichever is more stringent.
 3. 5.408.3 Provide plan to incorporate construction waste reduction of at least 75%.

PART 2 – MATERIALS NOT USED

PART 2 – EXECUTION

3.01 PLANNING AND DESIGN

- A. Section 5.106
1. Develop Storm Water Pollution Prevention Plan for implementation and maintenance onsite throughout the construction process.
 2. Bicycle parking is to comply with Sections 5.106.4.1 and 5.106.4.2 or local ordinance, whichever is more stringent.
 3. If the project is anticipated to generate visitor traffic, provide permanently anchored bicycle racks within 200 feet of the visitors' entrance, readily visible to passers-by, for 5% of visitor motorized vehicle parking capacity, with a minimum of one two-bike capacity rack.
 4. Meet lighting power requirements in the California Energy Code, CCR, Title 24, Part 6, and design interior and exterior lighting such that zero direct-beam illumination leaves the building site. Comply with zones 1-4 and lighting zone characteristics as defined in Chapter 10 of the California Administrative Code, CCR, Title 24, Part 1 using the following strategies:
 - a. Shield all exterior luminaires or provide cutoff luminaires per Section 132 (b) of the California Energy Code.
 - b. Contain interior lighting within each source.
 - c. Allow no more than .01 horizontal foot-candles to escape 15 feet beyond the site boundary.
 - d. Automatically control exterior lighting dusk to dawn to turn off or lower light levels during inactive period

3.02 ENERGY EFFICIENCY

- A. Section 5.201.1
1. Comply with aforementioned section.

3.03 WATER EFFICIENCY AND CONSERVATION

- A. Section 5.303
1. Separate meters or metering devices shall be installed for the uses described in Sections 503.1.1 and 503.1.2.
 2. Plumbing fixtures and fixture fittings are required to reduce the overall use of potable water by 20%. This reduction shall be based on the maximum allowable water use per the plumbing fixture and fittings as required by the California Building Standards code.
- B. Section 5.304
1. Automatic irrigation system controllers installed at time of final inspection shall comply with the following:
 2. Controllers shall be weather or soil moisture-based controllers that automatically adjust irrigation in response to changes in plants' needs as weather conditions change.
 3. Weather-based controllers without integral rain sensors or communication systems that account for local rainfall shall have a separate wired or wireless rain sensor which

connects or communicates with the controller(s). Soil moisture-based controllers are not required to have a rain sensor input.

3.04 MATERIAL CONSERVATION AND RESOURCE EFFICIENCY

A. Section 5.408

1. Establish a construction waste management plan for the diverted materials, or meet local construction and demolition waste management ordinance, whichever is more stringent.
2. Documentation is required to be provided to the enforcing agency which demonstrates compliance with Section 5.408.2, items 1-4. The waste management plan shall be updated as necessary and shall be accessible during construction for examination by the enforcing agency.
3. Recycle and/or salvage for reuse a minimum of 75 percent of the non-hazardous construction and demolition debris, or meet a local construction and demolition waste management ordinance, whichever is more stringent. Calculations are required of materials diverted by weight or volume, but not both.
4. 100 percent of trees, stumps, rocks, and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled. For a phased project, such material may be stockpiled on site until the storage site is developed.

B. Section 5.410

1. For new buildings 10,000 sf and over, building commissioning shall be included in the design and construction processes of the building project to verify that the building systems and components meet the owner's or owner representative's project requirements. Commissioning shall be performed in accordance with this section by trained personnel with experience on projects of comparable size and complexity. Commissioning requirements shall include the following:
 - a. Owner's or owner representative's project requirements
 - b. Basis of Design
 - c. Commissioning measures shown in the construction documents
 - d. Commissioning plan
 - e. Functional performance testing
 - f. Documentation and training
 - g. Commissioning report
 - h. Testing and adjusting of systems shall be required for buildings less than 10,000 sf.
2. Operation and maintenance (O&M Manuals) are to be provided to the building owner or representative with detailed operating and maintenance instructions and copies of guaranties/warranties for each system. O&M instructions shall be consistent with OSHA requirements in CCR, Title 8, Section 5142, and other related regulations.
 - a. Include a copy of all inspection verifications and reports required by the enforcing agency.

3.05 ENVIRONMENTAL QUALITY

A. Section 5.504:

1. Covering of duct openings and protection of mechanical equipment during construction is required per section 5.504.3.
2. Finish materials must comply with tables 5.504.4.1 through 5.504.4.4.
3. Adhesives, sealants, and caulks must comply with local or regional air pollution control or air quality management district rules where applicable, or SCAQMD Rule 1168 VOC limits as indicated in tables 5.504.4.1 and 5.504.4.2. Aerosol adhesives shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of California Code of Regulations, Title 17, commencing with Section 94507.
4. Paints and coatings shall comply with the VOC limits in Table 1 of the ARB Architectural Coatings Suggested Control Measure, shown in Table 5.504.4.3, unless more stringent

- local limits apply. Aerosol paints and coatings shall meet the PWMIR Limits for ROC in Section 94522(a)(3) and other requirements as described in code section 5.504.4.3.1.
5. Verification of compliance of this section shall be provided including (1) Manufacturer's product specification and (2) Field verification of on-site product containers.
 6. All carpet installed in the building interior shall meet the testing and product requirements of one of the following:
 - a. Carpet and Rug Institute's Green Label Plus Program.
 - b. California Department of Public Health Standard Practice for the testing of VOC's (Specification 01350)
 - c. NSF/ANSI 140 at the Gold Level
 - d. Scientific Certifications Systems Sustainable Choice
 7. All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute Green Label program.
 8. All carpet adhesive shall meet the requirements of Table 5.504.4.1.
 9. Hardwood plywood, particleboard, and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood (17 CCR 93120 et seq), buy or before the dates specified in those sections, as shown in Table 5.504.4.5.
 10. Verification of compliance of this section shall be provided. Documentation shall include at least the following:
 - a. Product certifications and specifications
 - b. Chain of custody certifications
 - c. Other methods acceptable to the enforcing agency
 11. For 50% of the floor area receiving resilient flooring, install resilient flooring complying with the VOC-emission limits defined in the 2009 Collaborative for High Performance Schools (CHPS) criteria and listed on its Low-emitting Materials List (or product registry) or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.
 12. Verification of compliance shall be provided with documentation indicating that the resilient flooring materials meet the pollutant emission limits.
 13. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a MERV of 8. Replace all filtration media immediately prior to occupancy.
 14. Where outdoor areas are provided for smoking, prohibit smoking within 25 feet of building entries, outdoor intakes, and operable windows and in buildings. Signage to be posted to inform building occupants if no ordinances are in place.
- B. Section 5.505:
1. Buildings shall meet or exceed the provisions of California Building Code, CCR, Title 24, Part 2, Sections 1203 (Ventilation) and Chapter 14 (Exterior Walls). For additional measures not applicable to low-rise residential occupancies, see Section 5.407.2 of the Cal Green code.
 2. For mechanically or naturally ventilated spaces in buildings, meet the minimum requirements of Section 121 (Requirements for Ventilation) of the California Energy Code, CCR, Title 24, Part 6, or the applicable local code, whichever is more stringent, and Chapter 4 of CCR, Title 8.
 3. For buildings equipped with demand control ventilation, carbon dioxide sensors and ventilation controls shall be specified and installed in accordance with the requirements of the current edition of the California Energy Code, CCR, Title 24, Part 6, Section 121(c).
- C. Section 5.507:
1. Employ building assemblies and components with Sound Transmission Coefficient (STC) values determined in accordance with ASTM E90 and ASTM E413.

- a. Wall and roof-ceiling assemblies making up the building envelope shall have an STC of at least 50, and exterior windows shall have a minimum STC of 30 for any of the following locations: (1) Within 1000 feet of right of ways of freeways, (2) Within 5 mile. of airports serving more than 10,000 commercial jets per year, (3) Where sound levels at the property line regularly exceed 65 decibels, other than occasional sound due to church bells, train horns, emergency vehicles, and public warning systems.
 - b. Wall and floor-ceiling assemblies separating tenant spaces and tenant spaces and public spaces shall have an STC of at least 40.
- D. Section 5.508:
 - 1. Installations of HVAC, refrigeration and fire suppression equipment shall not contain CFC's nor halon.

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SECTION 01 35 46
CONSTRUCTION INDOOR AIR QUALITY PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for managing emissions and moisture control during construction.

1.03 DEFINITIONS

- A. Sustainable Design Related Terminology: As defined is ASTM E 2114.
- B. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.
- C. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.
 - 1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).
- D. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.
- E. Interior Final Finishes: Materials and products that will be exposed at interior, occupied spaces including but not limited to flooring, wallcovering, finish carpentry, and ceilings.
- F. Packaged Dry Products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging including but not limited to carpets, resilient flooring, ceiling tiles, and insulation.
- G. Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

1.04 QUALITY ASSURANCE

- A. Inspection and Testing Lab Qualifications: Minimum of 5 years experience in performing the types of testing specified herein.

1.05 PRECONSTRUCTION MEETING

- A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner and Architect/Engineer to review and discuss the proposed IAQ Management Plan and develop a mutual understanding of detailed requirements for maintaining indoor air quality and environmental protection.

1.06 SUBMITTALS

- A. Indoor Air Quality (IAQ) Management Plan: Not less than 10 business days before the Pre-construction meeting, prepare and submit an IAQ Management Plan including, but not limited to, the following:

1. Procedures for control of emissions during construction.
 - a. Identify schedule for application of interior finishes.
 2. Procedures for moisture control during construction.
 - a. Identify porous materials and absorptive materials.
 - b. Identify schedule for inspection of stored and installed absorptive materials.
 3. Revise and resubmit Plan as required by Owner.
 - a. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.
- B. Product Data:
1. Submit product data for filtration media used during construction and during operation. Include Minimum Efficiency Reporting Value (MERV).
 2. Submit air pressure difference maps for each mode of operation of HVAC.
 3. Material Safety Data Sheets: Submit MSDSs for inclusion in Operation and Maintenance Manual for the following products. Coordinate with Section 01 78 23 — Operation and Maintenance Data.
 - a. Adhesives.
 - b. Floor and wall patching/leveling materials.
 - c. Caulking and sealants.
 - d. Insulating materials.
 - e. Fireproofing and firestopping.
 - f. Carpet.
 - g. Paint.
 - h. Clear finish for wood surfaces.
 - i. Lubricants.
 - j. Cleaning products.
- C. Inspection and Test Reports:
1. Moisture control inspections.
 2. Moisture content testing.
 3. Moisture penetration testing.
 4. Microbial growth testing.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 IAQ MANAGEMENT - EMISSIONS CONTROL

- A. Provide point person responsible for the implementation and assurance that the Indoor Air Quality Plan is being implemented.
- B. Flush-Out: After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60%.

3.02 IAQ MANAGEMENT - MOISTURE CONTROL

- A. Housekeeping:
 1. Keep materials dry. Protect stored on-site and installed absorptive materials from moisture damage.
 2. Verify that installed materials and products are dry prior to sealing and weatherproofing the building envelope.
 3. Install interior absorptive materials only after building envelope is sealed and weatherproofed.
- B. Inspections: Document and report results of inspections; state whether or not inspections indicate satisfactory conditions.

1. Examine materials for dampness as they arrive. If acceptable to Owner, dry damp materials completely prior to installation; otherwise, reject materials that arrive damp.
 2. Examine materials for mold as they arrive and reject materials that arrive contaminated with mold.
 3. Inspect stored and installed absorptive materials regularly for dampness and mold growth. Inspect weekly.
 - a. Where stored on-site or installed absorptive materials become wet, notify Architect/Engineer and Owner. Inspect for damage. If acceptable to Owner, dry completely prior to closing in assemblies; otherwise, remove and replace with new materials.
 4. Basement: Monitor basement and crawlspace humidity, and dehumidify when relative humidity is greater than 85 percent for more than 2 weeks or at the first sign of mold growth.
 5. Site drainage: Verify that final grades of site work and landscaping drain surface water and ground water away from the building.
 6. Weather-proofing: Inspect moisture control materials as they are being installed. Include the following:
 - a. Air and weather-resistive barrier: Verify air and weather-resistive barrier is installed without punctures and/or other damage. Verify air barrier and weather-resistive is sealed completely.
 - b. Flashing: Verify correct shingling of the flashing for roof, walls, windows, doors, and other penetrations.
 - c. Insulation layer: Verify insulation is installed without voids.
 - d. Roofing: In accordance with ASTM D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair
 7. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
 8. HVAC: Inspect HVAC system as specified in Section 23 08 00 — Commissioning.
 - a. And, inspect HVAC to verify:
 - 1) Condensate pans are sloped and plumbed correctly.
 - 2) Access panels are installed to allow for inspection and cleaning of coils and (a) ductwork downstream of coils.
 - 3) Ductwork and return plenums are air sealed.
 - 4) Duct insulation is installed and sealed.
 - 5) Chilled water line and refrigerant line insulation are installed and sealed.
- C. Schedule:
1. Schedule work such that absorptive materials, including but not limited to porous insulations, paper-faced gypsum board, ceiling tile, and finish flooring, are not installed until they can be protected from rain and construction-related water.
 2. Weather-proof as quickly as possible. Schedule installation of moisture-control materials, including but not limited to air and weather-resistive barriers, flashing, exterior sealants and roofing, at the earliest possible time.
- D. Testing for Moisture Content: Test moisture content of porous materials and absorptive materials to ensure that they are dry before sealing them into an assembly. Document and report results of testing. Where tests are not satisfactory, dry materials and retest. If satisfactory results cannot be obtained with retest, remove and replace with new materials.
1. Concrete: Moisture test prior to finish flooring application as specified in Division 09.
 2. Wood: Moisture test as per ASTM D4444 - Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters; unless otherwise indicated acceptable upper limits for wood products are ??? 20% at center of piece; ??? 15% at surface.
 3. Gypsum Board, Gypsum Plaster, Insulation, and other absorptive materials: Moisture test with a Pinless Moisture Meter to assess patterns of moisture, if any.

- E. Testing for Moisture Penetration:
1. Windows: Test as per ASTM E1105 Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference at 100 percent static-air-pressure difference specified in applicable Division 08 Sections; unless otherwise indicated, acceptable upper limits are no leakage for 15 minutes.
 - a. Number of Tests: 1 percent of openings but not less than two.
 2. Horizontal Waterproofing (not roofing): Test as per ASTM D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations; acceptable upper limits are no leakage for 15 minutes.
 - a. Test frequency: 100 percent of horizontal waterproofed surfaces.
 3. Masonry: Test as per ASTM C1601 Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces; acceptable upper limits are no leakage for 15 minutes.
 4. Exterior Walls:
 - a. Air tightness of the enclosure test: ASTM E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization or ASTM E1827
 - 1) Air Leakage: The mean value of the air leakage flow rate calculated from measured data at 0.3 in wg (75 Pa) must not exceed 0.25 cu ft/ minute per square foot of envelope area. Measurements must be referenced at standard conditions of 14.696 psi (101.325 KPa) and 68 deg F.
- F. Testing for Support of Microbial Growth: Test and report in accordance with ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers. Indicate susceptibility of product or material to colonization and amplification of microorganisms. Identify microorganisms and conditions of testing.
1. Normal conditions: Perform testing at 35 degrees Centigrade and 50 percent relative humidity.
 2. Extreme conditions: Perform worst case scenarios screening tests by providing an atmosphere where environmental conditions may be favorable for microbial growth.
 3. Perform testing for the following:
 - a. Fireproofing material on appropriate substrate.
 - b. Ceiling tile.
 - c. Wall covering.
 - d. Other appropriate material.

END OF SECTION

**SECTION 01 35 53
SECURITY PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security measures including entry control, personnel identification, guard service, miscellaneous restrictions, and security fencing through the construction phase.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: use of premises and occupancy.
- B. Section 01 50 00 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

- A. Initiate program at project mobilization.
- B. Maintain program throughout construction period until Owner acceptance precludes the need for Contractor security.

1.04 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Contractor shall control entrance of persons and vehicles related to Owner's operations.

1.05 PERSONNEL IDENTIFICATION

- A. Provide identification badge to each person authorized to enter premises.
- B. Badge To Include: Personal photograph, name, assigned number , expiration date and employer.
- C. Maintain a list of accredited persons, submit copy to Owner on request.
- D. Require return of badges at expiration of their employment on the Work.

1.06 GUARD SERVICE

- A. Employ uniformed patrol service to provide surveillance of site during all non- working hours.

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 SECTION INCLUDES

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

1.02 REFERENCE STANDARDS

- A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025.
- B. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 - 1. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
 - 2. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
- C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 - 2. Include required product data and shop drawings.
 - 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- D. Shop Drawings: Submit drawings for Architect's benefit as contract administrator or for Owners information.
 - 1. Submit for information for the limited purpose of assessing compliance with the design concept expressed in the Contract Documents. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.
- E. Reports: After each test/inspection, promptly submit report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.

- d. Date and time of sampling or inspection.
- e. Identification of product and specifications section.
- f. Location in the Project.
- g. Type of test/inspection.
- h. Date of test/inspection.
- i. Results of test/inspection.
- j. Compliance with Contract Documents.
- k. When requested by Architect, provide interpretation of results.
- 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- F. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect.
 - 1. Indicate the material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit report within 15 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing compliance with the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency names, addresses, and telephone numbers, and names of full time registered Engineer and responsible officers.
 - 2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Contractor's Quality Control (CQC) Plan:
 - 1. Prior to start of work, Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality.
 - 1) Include duties, responsibilities of each person assigned to CQC function.
 - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - 1) Management and control of documents and records relating to quality.
 - 2) Communications.
 - 3) Coordination procedures.
 - 4) Inspection and testing procedures and scheduling.
 - 5) Tracking deficiencies from identification, through acceptable corrective action, and verification.
 - c. Owner will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.

- d. Acceptance of the plan is required prior to start of construction activities. Owner's acceptance of the plan will be conditional and Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.
- e. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date specified in the individual specification sections, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
 - 1. Manufacturers will have copies for distribution with the product.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ and pay for services of an independent testing agency to perform other special inspections required by code and jurisdiction, not to include regular inspections or testing of the work.
- B. As indicated in individual specification sections, Contractor shall employ and pay for services of independent agencies to perform specified testing and inspection.
- C. Employment of an agency in no way relieves Contractor obligation to perform Work in accordance with requirements of Contract Documents.
- D. Contractor Employed Agency:
 - 1. Inspection agency: Comply with requirements of ASTM E329.
 - 2. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
 - 3. Laboratory: Authorized to operate in the State of California.
 - 4. Laboratory Staff: Maintain a full time registered Engineer or specialist on staff to review services.
 - 5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
 - 1. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- B. Exterior Mock-ups: Construct exterior mock-up as indicated in the Specification Section for that product.
 - 1. Coordinate with the Architect for location of installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- C. Interior Mock-ups: Construct interior mock-ups as in the Specification Section for that product.
 - 1. Coordinate installation of materials, products, and assemblies as required in specification sections; finish according to requirements.
 - 2. Provide required lighting and any supplemental lighting where required to enable Architect to evaluate quality of the mock-up.
- D. Notify Architect and Owner fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
- E. Provide supervisory personnel and workers that will be employed during the construction of the Project.
- F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
- I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- J. Where mock-up has been accepted by Architect and is specified in product specification sections to remain, protect mock-up throughout construction.
- K. Where mock-up is not located to remain as part of the work, once the quality of the work has been established and demonstrated on the building, demolish the mock-up materials. Salvage and reuse when possible.

3.03 TOLERANCES

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

3.04 TESTING AND INSPECTION

- A. Identify local jurisdiction code requirements for inspections.

- B. Identify specification section requirements for testing.
- C. Testing Agency Duties:
 - 1. Perform specified sampling and testing of products in accordance with specified standards.
 - 2. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 3. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 4. Perform additional tests and inspections required by Architect.
 - 5. Submit reports of all tests/inspections specified.
- D. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- E. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- F. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- G. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

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

END OF SECTION

**SECTION 01 41 00
TESTING AND INSPECTION**

PART 1 - GENERAL

1.01 CONTRACTOR'S QUALITY CONTROL SYSTEM

- A. The Contractor shall establish a quality control system to perform sufficient inspection and tests of all items of work, including that of his subcontractors, to ensure conformance to the Contract Documents for materials, workmanship, construction, finish, functional performance and identification.
- B. This control shall be established for all construction where the Contract Documents provide for specific compliance tests by testing laboratories or engineers.
- C. Contractor's control system shall specifically include all testing assigned to the Contractor or his subcontractors by various sections of the Specifications.
 - 1. Contractor's quality control system is the means by which he assures himself that his construction complies with the requirements of the Contract Documents.
 - 2. Controls shall be adequate to cover all construction operations and shall be keyed to the proposed construction schedule.

1.02 INSPECTION OF THE WORK/TESTING LABORATORY

- A. The Work shall be conducted under the general observation of the Architect and shall be subject to inspection by the Architect and other representatives of the City to ensure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop, or field inspection, as required. The Architect shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.
- B. The presence of the Architect or any inspector(s), however shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the Architect or any inspector(s).
- C. Testing and inspections per special inspection requirements of the Uniform Building Code, and as called for in these specifications, will be performed by an independent testing laboratory as selected and paid for by the Owner.
- D. Testing and inspection services which are performed shall be in accordance with requirements of the Uniform Building Code, current adopted edition, and as specified herein. Testing and inspection services shall verify that work meets the requirements of the contract documents.
 - 1. Selection of the material required to be tested will be by the laboratory and not by the Contractor.
- E. Testing and inspections will be performed by an independent testing laboratory selected and employed by the City. Procedural and acceptance criteria are set forth in California Code of Regulations (CCR) Title 24 Part 1, Administrative Regulations, Sec. 4-335, for testing of materials and Sec. 4-333 for special inspections and Interpretation of Regulations, IR 1-1, dated 9/89.
- F. Testing and inspection services which are performed shall be in accordance with requirements of CCR Title 24 Part 1, Administrative Regulations, and as specified herein. Testing and inspection services shall verify that work meets the requirements of the Contract Documents.
- G. In general, tests and inspections for structural materials shall include all items enumerated on the Structural Tests and Inspections list for this project as prepared and distributed by the Architect.
- H. Test reports shall be signed by a registered Civil Engineer licensed in the State of California.

1.03 PAYMENTS

- A. Costs of initial testing and special inspection, except as specifically modified hereinafter or specified otherwise in the technical sections, will be paid for by the City, provided such tests indicate compliance with the contract documents. Initial tests and inspections are defined as the first tests and inspections as specified.
- B. In the event a test or inspection indicates failure of a material or procedure to meet requirements of the contract documents, costs for retesting will be paid for by the Contractor and backcharged to the subcontractor.
- C. Additional tests not specified but requested by the Architect or City, shall be paid for by the City, unless results of such tests or inspections are found not to be in compliance with the Contract Documents, in which case the subcontractor will be backcharged for the costs for initial testing as well as retesting and re-inspection.
- D. Costs for additional tests or inspections required because of change in materials being provided or change of source of supply shall be paid for by the Contractor and backcharged to the subcontractor.
- E. Costs for any work which is required to correct any deficiencies shall be paid for by the subcontractor.
- F. Costs for any testing which is required solely for the convenience of the subcontractor in his scheduling and performance of the work shall be paid for by the subcontractor.
- G. Overtime costs for testing and inspections performed outside the regular workday hours, including weekends and holidays, will be paid for by the Contractor and backcharged to the subcontractor.
- H. Testing Laboratory will separate and identify on the invoices, the costs covering all testing and inspections which are to be backcharged to the subcontractor as specified above.

1.04 TESTING AND INSPECTION REPORT

- A. Testing laboratory will certify in writing that all work specified or required to be tested and inspected conforms to or does not conform to drawings, specifications and applicable building codes.
- B. The Testing Laboratory will make the following distribution of all test and inspection reports within 15 days of testing:
 - 1. City 2
 - 2. Architect 1
 - 3. Structural Engineer 1
 - 4. Contractor 1
 - 5. Governing Building Dept. 1
- C. Test reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of CCR Title 24 Part 1 Administrative Regulations, Part 2 California Building Code, and with the approved specifications. They shall also state definitely whether or not the material or materials tested comply with requirements.

1.05 REPORTING TEST OR INSPECTION FAILURES

- A. Immediately upon Testing Laboratory determination of a test or inspection failure, the Laboratory will telephone the results of test to Architect. On the same day, Laboratory will send written test results to those named on above distribution list.
 - 1. Immediately upon notification of test or inspection failure, the Contractor shall notify the Architect of the test results and what steps will be taken to correct the problem areas.

1.06 AVAILABILITY OF SAMPLES

- A. Contractor shall make materials required for testing available to Laboratory and assist in acquiring these materials as directed by Architect. The samples shall be taken under the immediate direction and supervision of the Testing Laboratory.
- B. If work which is required to be tested or inspected is covered up without prior notice or approval, such work may be uncovered at the discretion of Architect.
- C. Unless otherwise specified, Contractor shall notify Testing Laboratory a minimum of ten (10) working days in advance of all required tests, and a minimum of two (2) working days in advance of all required inspections.
- D. Contractor shall give sufficient advance notice to Testing Laboratory in the event of cancellation or time extension of a scheduled test or inspection.
- E. Material shipped by the Contractor from the source of supply before having satisfactorily passed such testing and inspection or before the receipt of notice from the City's Representative that such testing and inspection will not be required, shall not be incorporated in the Project.

1.07 REMOVAL OF MATERIALS

- A. Unless otherwise directed, materials not conforming to the requirements of Contract Documents shall be promptly removed from the job site.

1.08 INSPECTION BY THE CITY

- A. The Architect shall at all times have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
- B. The City shall have the right to reject materials and workmanship which are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the City. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the City may correct such rejected work and charge the expense to the Contractor.
- C. Should it be considered necessary or advisable by the City at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the completed work, the Contractor shall on request promptly furnish necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

1.09 CITY'S INSPECTOR

- A. An Inspector employed by the City in accordance with the requirements of CCR Title 24 Part 1, Administrative Regulations, will be assigned to the work. Their duties are specifically defined in CCR Title 24 Part 1, Sec. 4-342.
- B. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. The Inspector shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 43 46
SEISMIC DESIGN CRITERIA FOR EQUIPMENT & NON-STRUCTURAL COMPONENTS

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASCE 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.

1.02 DEFINITIONS

- A. Non-Structural Components: See Table 13.6-1 of ASCE 7-16 for references to example types of components that require seismic anchorage.

1.03 SUMMARY

- A. This specification defines the seismic design criteria to be used for the design of equipment, including the supporting skids and frames, equipment anchorage and seismic bracing for architectural, process, mechanical and electrical components.
- B. The vendor is responsible for engaging the services of a qualified licensed professional engineer in the State of California with a minimum 5 years of experience in structural seismic design to provide the analysis, calculations, seismic bracing, and installation details for equipment and equipment anchorage, skids and frames in accordance with specified criteria and applicable codes. The vendor's engineer is to provide construction support during the equipment installation for any field problem that may arise during construction.
- C. The vendor shall design and install all support and bracing systems except as noted. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.

1.04 REFERENCES

- A. California Building Code (CBC), 2022 Edition with amendments for Essential Services Facility occupancy.
- B. American Society of Civil Engineers (ASCE), ASCE 7, Minimum Design Loads for Buildings and Other Structures, 2022 edition.
- C. American Society of Heating and Ventilating and Air Conditioning (ASHRAE), HVAC Applications, Latest Edition, Seismic and Wind Restrain Design.
 - 1. The lateral force equations in ASCE 7, as appropriate, should be used to determine the lateral seismic force. The force calculations found in these standards are based on a previous code provision that may not comply with the latest ASCE 7.
- D. American Society of Mechanical Engineers (ASME), ASME B31E – Standard for the Seismic Design and Retrofit of Above-Ground Piping Systems (2008 Edition).
- E. Structural Engineers Association of California, Recommended Lateral Force Requirements and Commentary, Latest Edition.
- F. Seismic Restraint Manual Guidelines for Mechanical Systems, Latest Edition (SMACNA).
 - 1. SYSTEM DESCRIPTION
- G. Site Criteria
 - 1. Risk Category IV
 - 2. Spectral Acceleration $S_s = 1.688\text{ g}$ & $S_1 = 0.604\text{ g}$ Site Class "D"
 - 3. Seismic Design Category "D"
- H. Design Criteria

1. Importance Factor $I_p = 1.5$ for all equipment
- I. Design Requirements
1. All mechanical and electrical equipment/devices, attachments and supports shall be designed to withstand the specified seismic loads and comply with ASCE 7 seismic design detailed requirement for strength and displacement.
 2. Equipment design is solely the responsibility of the equipment supplier. The equipment shall be designed so the strength and anchorage of the internal and external components or equipment piping exceed that of the forces used to restrain and to anchor the equipment to the supporting structure. Guidance as to which pieces of equipment and parts require seismic design can be found in the commentary section of SEAOC Recommended Lateral Force Requirements and Commentary, specifically Section C107. Equipment with flexible and /or cantilevered lateral system shall be avoided.
 3. Seismic design parameters as defined by the latest ASCE 7.
 - a. R_p for anchorage shall consider the ductility and the embedment depth of the anchor.
 - b. Additional factor for anchorage to cracked concrete and masonry structure shall be applied as required by codes.
 4. Components and Equipment Supported by Structures
 - a. The lateral force is to be applied at the center of mass of the component and can act in any lateral direction.
 5. Seismic restraint for architectural components and mechanical / electrical distribution system is to be designed per the latest ASCE 7 – seismic design requirements.
- J. Connection Requirements
1. Component attachments are to be welded, bolted, or otherwise positively connected without consideration of frictional resistance resulting from gravity loads. Do not weld on any joists or beams without written approval from Structural Engineer.
 2. Attachments to concrete shall be made with anchors suitable for cyclical loads. Expansion or chemical anchors not rated for Seismic Design Category “D”, “E” & “F” shall not be used for seismic anchorage.
 3. Powder driven fasteners shall not be used for tension load applications.
 4. Friction clips shall not be used for anchorage.
 5. Welded plate washers with standard holes shall be used at bolted connections with oversized holes on the base plate.
 6. Unless the base sheet metal is reinforced with stiffeners and is designed to take the bending from the uplift forces, oversized plate washers shall be used at bolted connection through the base sheet metal.
 7. Components mounted on vibration isolator system shall have a bumper restraint or a snubber in each horizontal direction. The design force is to be taken as $2F_p$ unless the nominal clearance (air gap) between the frame and restraint is equal or less than 0.25”.
 8. Specify hole diameter, depth and hole drilling method in concrete or masonry if the anchor requires specific drilling and holes larger than the bolt diameter.
- K. Building Structure Integrity
1. Building structural integrity shall be maintained by designing seismic bracing system that will not over stress existing structure in addition to the following requirements:
 - a. Attach bracings to the beam flange or to the top chord panel point of the truss where the diaphragm/floor is attached. Beam flange or top chord to diaphragm connection shall be checked and provide a strut to transfer the seismic force to the diaphragm if the existing diaphragm to beam/top chord connection is not adequate.
 - b. Locate the hanger center on existing structural members. The hangers and bracing systems shall not induce eccentric loading or torsion to the supporting structural member.
 - c. Spread the loads uniformly to all existing structural members.

- d. Existing structural concrete may be core drilled with prior approval from the Engineer. Locate existing rebar before drilling to avoid damaging the rebar.
- e. The equipment engineer shall review the existing building structure at the equipment location. The supporting structure at the point of attachment/anchorage shall be checked to assure that it will not be over stressed under the combination of dead and live loads plus seismic loads.
- L. Refer to structural drawings for material specifications of structure. If no structural drawings are available, assume 3000 psi concrete and ASTM A36 steel for attachment design and confirm these values with Structural Engineer before proceeding with the design.
- M. Deformation Compatibility
 - 1. The design and detailing of anchorage and restraints shall comply with ASCE 7-16, Section 13.3.
 - 2. Do not brace any equipment to parts of building structure which may respond differently during earthquake. Do not pass seismic bracing through building expansion and contraction joints.
 - 3. The equipment frame inelastic displacement due to the seismic loads shall not exceed the codes' allowable displacement, and it shall be limited so as not to damage any piping and accessories attached to it.

1.05 SUBMITTALS

- A. Calculations and Drawings
 - 1. Submit structural calculations and a separate drawing/sketches stamped and signed by the California Licensed Structural Engineer in good standing. The calculations and drawings shall include the following information as minimum:
 - a. Empty weight
 - b. Operating weight
 - c. Center of mass in plan
 - d. Center of mass in elevation
 - e. Seismic vertical, lateral, and overturning loads
 - f. Impact loads
 - g. Vibration loads
 - h. Load combinations in accordance with applicable codes
 - i. Foundation reactions
 - j. Isolator reactions where isolators are used
 - k. Anchor bolt brand, type, size, embedment depth in concrete, grip distance, and locations, including specific drilling and special inspection requirement
 - l. Platform design layout, structural loads, material list, and connection details
 - m. Installation sequence if it requires specific sequence to fasten the anchorage
 - 2. Coordination drawings to demonstrate interface with adjacent systems including location and space required for seismic bracing and anchorage.
 - 3. Furnish certification letter in the calculations stating the design of the equipment components and anchorage comply with the seismic design requirement per ASCE 7 13.2.2.1. and applicable local building codes.
 - 4. In lieu of stamped structural calculations and drawings and unless it is required by Building Official, a Manufacturer's certification letter as described above is acceptable for equipment design that has been approved by national standards, such as ANSI, ASME, etc.
- B. Installing contractor to submit following reports to Structural Engineer and Building Official:
 - 1. Bolt inspection reports for field installed bolts for structural components including the location of the test, date of the test, bolt diameter, and recorded torque.
 - 2. Non-destructive testing program for welding and anchors.

3. Field weld inspection reports for structural welds including the type of weld, location of the weld, nondestructive testing procedure and results, welder certification, qualified welding description or number in accordance with the latest AWS D1.1.
4. Reports covering other structural activities requiring inspection in accordance with the applicable local building codes.

PART 2 - PRODUCT

2.01 MATERIALS

- A. Furnish all substructures and fasteners required to comply with the limitations given below. Use materials as specified in the various sections and as appropriate to the use. All fasteners used for seismic anchorage shall have an evaluation report and a rating for use in Seismic Design Category "D", "E", and "F" by a nationally recognized third party agency, such as International Code Councils (ICC).
- B. All exterior materials: hot dipped galvanized or stainless steel.

PART 3 - EXECUTION

3.01 GUIDELINES AND LIMITATIONS

- A. The General Contractor shall coordinate the load requirements from all sub-contractors so that no combination of loads exceeds the limitations given below without written approval.
- B. Maximum Loading: Attach no loads greater than the following without specific approval of the Structural Engineer and DSA.
 1. Metal deck without concrete fill - acoustical tile and gypsum board ceilings only; no piping, ducting or conduit. Maximum ceiling weight - 3.5 psf. Maximum wire hanger load = 60#.
 2. Steel beams and girders: water and gas piping, electrical conduits, ducting and trapeze of same not to exceed 3.0 psf. Maximum load on a single span = 600#. Mechanical units hung from beams shall not exceed 1000# unless specifically indicated on structural plans.
 3. Steel Joists - Loads from ceiling, piping, conduit and ducting shall not exceed 8 psf. Maximum concentrated load = 500 lbs. per joist.

3.02 SEISMIC BRACING

- A. Design and install seismic bracing so as not to ground out vibration and sound isolation items.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Furnish, install and maintain temporary facilities as hereunder specified, plus other unspecified temporary facilities, including labor, materials, services, utilities, and equipment, as may be required for proper performance of Contract, except as otherwise provided. Temporary facilities shall be approved by the Owner and other authorities having legal jurisdiction. Locate facilities where and as directed and maintain in safe and sanitary condition at all times until completion of Work.
- B. At completion of work, or sooner when no longer needed, remove all temporary facilities, except where certain facilities are specified to remain or to be relocated for use under future contracts

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements
- B. Section 01 35 46 - Construction Indoor Air Quality Management
- C. Section 01 71 00 - Contract Closeout Procedures
- D. Section 01 74 00 – Cleaning
- E. Section 01 74 19 - Construction Waste Management

1.03 SUBMITTALS

- A. Submit in quantity, format and type as specified herein.
- B. Equipment Data: Manufacturer's data for each type of equipment.
- C. Furniture and Furnishings Data: Manufacturer's data for each type.
- D. Field Office for the Owner's use: Submit a dimensioned floor plan of the Field Office, with furnishings and equipment shown for approval prior to fabrication and installation.

1.04 FIELD OFFICE

- A. Field Office: Provide wheel mounted office trailer(s) in good condition. Provide enough space to fit offices, equipment and furnishings noted in this section for a fully operational and functional office. Trailer shall display California Commercial Coach Insignia as evidence of meeting or exceeding minimum Construction and Fire Safety requirements of Title 25, California Code of Regulations (CCR), Chapter 3, Sub Chapter 2, Article 3.
 - 1. Wind and snow load design requirements shall meet most stringent criteria for project location during Contract period. Design load criteria shall be posted within unit per Section 4360.1 of referenced CCR.
 - 2. Partition trailer with walls to ceilings and provide minimum (3) private offices, a Conference Area with a conference table and seating capacity of twelve (12) persons. Provide lockable door at private offices. Private offices shall be for the Inspector of Record and Construction Manager and Owner/Architect. Provide other workstations for an Administrative Assistant and temporary space for Visitors. In addition, provide a space to contain a plan table for the inspector(s).
 - 3. Provide heating and air conditioning unit mounted on end of trailer of sufficient function, capacity and ductwork for equal distribution of conditioned air to all rooms. Roof mounted units are not acceptable.
 - 4. Install trailer to be level both ways; mount on concrete piers (with load off wheels). Furnish and install required tie down accessories per Section 4368 of referenced 25 CCR 3.2.3.
 - 5. Provide two (2) exterior doors and an accessible path of travel in accordance with CBC Chapter 11B.

6. Windows, doors and vents shall be provided with insect and security screens; maintain in good condition during Contract.
 7. Provide furnishings (including installation) in good condition, or built-in equivalents, for Contractor's staff and other necessary uses.
 8. Provide one (1) teleconference speaker phone for the Conference Area.
 9. Provide and maintain printers, as required to print, copy and scan documents. Free-standing, low- or no- emission, high speed, color & black & white copier, high cycle, sorter/collator, pdf copies, and double-sided copies. Multiple paper sizes (11" x 17", 8 1/2" x 11", 8 1/2" x 14"). Provide all copier supplies, paper, toner, and maintenance services as needed.
 10. Provide medium duty, high capacity, jam resistant 18 sheet shredder.
 11. Provide minimum 16.7 cubic foot refrigerator/freezer.
 12. Provide minimum 1200 watt countertop microwave.
 13. Trailer office and furnishings shall remain property of Contractor; remove from site upon completion of Contract.
 14. Provide one (1) unisex restroom with sink (hot and cold water) located inside office trailer for Owner and Visitors.
 15. Provide office, kitchen and restroom supplies, and keep continually stocked.
 16. The Field Office for the Owner shall be ready for use, fully functional, within 30 days prior to the start of Construction.
- B. Contractor's Field Office: Contractor may provide field office facilities for Contractor's use as desired. Contractor's field office shall be neat and substantial and expenses therefore shall be paid by Contractor.

1.05 EQUIPMENT FOR OWNERS USE

- A. Computers and Accessories:
1. Provide two high speed internet connections for Owner/Architect's use.
 2. Provide one high speed internet connections for desktop or laptop computer using one large screen, wall mounted monitor and current Microsoft® Office Professional software and Bluebeam Revu software.
 3. All hardware and associated software provided by the Contractor in this paragraph shall remain property of the Contractor, and may be used for other meetings when the Owner is not using them.
 4. All computers shall be connected by the Contractor to high speed internet with connectivity from each computer to the copier/scanner/printer/fax machine(s).
 - a. Contractor shall provide hardwired and wireless network in Owner's office and set up computer equipment with copier/scanner/printer/fax to function properly.

1.06 UTILITY AND SERVICES

- A. Telephone Service: AT&T Telephone Service (VOIP or other) and high-speed internet service required by the Owner shall be provided and paid for by the Contractor. Minimum requirement shall be one (1) phone number for Conference Area, high speed internet service at minimum five (5) locations; (four (4) offices and one (1) Conference Area).
- B. Internet Service Provider (ISP): Cox Communications service. Contractor shall provide an ISP for the duration of the project to completion. Service shall be ready no later than ten (10) days prior to mobilization of the start of construction. Service shall be paid by the Contractor for the duration of the project.
- C. Electrical Service: Provide all proper connections and continuously pay for service for the duration of the Work.
- D. Contractor shall provide coffee and drinking water.
- E. Contractor to pay for maintenance of all electronic devices, including the copier/scanner/printer/fax machines and provide sufficient paper and toner supplies, as required for the duration of the project.

- F. Janitorial and Sanitation Service: Provide professional cleaning of job trailer and Owner's restroom not less than once weekly, including, but not limited to, trash, recycling, fill paper dispensers; clean, and dust all furniture; sweep and mop flooring.
- G. The Contractor shall furnish the services of an independent computer/low voltage installer to interconnect and make fully operational all computers identified in this section. Interconnection and operation shall include providing cables, connections, troubleshooting, service calls, etc. necessary to provide 100% communication (e-mail and internet) and software operation of computer for the duration of this contract.

1.07 CONSTRUCTION EQUIPMENT

- A. Erect, equip, operate, and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances, rules, and regulations of authorities having jurisdiction.
- B. Provide and maintain scaffolding, staging, runways, and similar equipment, as needed.

1.08 SAFETY PRECAUTIONS

- A. Provide and maintain barricades, fencing, shoring, pedestrian walkways including attached lights, other lights, and other safety precautions to properly guard against personal injury, property damage, vandalism, and theft.
 - 1. Barricades, walkways, etc., including attached lights, and other safety precautions provided are required to be left in place for the duration of construction.
 - 2. Contractor shall assume responsibility for maintaining such items for duration of Work of this Contract, and shall repair, replace, and relocate them as necessary for safe protection.
- B. Contractor shall provide such additional safety precautions as may be prescribed by authorities having jurisdiction.
- C. Fully inform each subcontractor and material supplier as to requirements of applicable Safety Orders and equipment.

1.09 ROADS AND ACCESSWAYS

- A. Entrance to Work Site: Contractor and Contractor's employees and subcontractors shall use certain access roads or entrance ways as indicated on the Drawings or as directed by Owner.
 - 1. Maintain these roads in satisfactory condition during Contract time, and repair damages attributable to Work of this Project at intervals as needed. At completion of Contract, roads and entrance ways shall be left in condition at least equal to that existing at start of Contract, except as may be otherwise required by Contract documents.
- B. Permanent Improvements: Where Contract calls for permanent sidewalk, road, and other ground improvements, and such permanent improvements are completed, or essentially completed within construction period, Contractor does not have vested right to use such improvements as temporary facilities.
- C. Use of permanent improvements by Contractor shall be subject to approval by Owner. Contractor shall retain responsibility over improvements, whether using them or not.

1.10 USE OF OWNER 'S PROPERTY

- A. On Site Storage and Work Areas: The Owner will allocate available on-site storage and work areas to Contractor, subject to change as may be necessary by job progress, such as site development or other intervening work.
- B. Owner Property: Operations shall be confined to Owner property and shall not encroach on areas other than those designated or approved for such use by Owner.
 - 1. Ascertain, observe, and comply with rules and regulations in effect at Owner occupied facilities, including, but not restricted to, parking and traffic regulations, security restrictions, hours of allowable ingress and egress as to main arteries, occupied buildings, and the like.

- C. Use of Sidewalks and Streets: Contractor shall make arrangements with the City of Newport Beach, as required, for temporary use of streets and sidewalks and shall abide by rules, regulations, and ordinances, obtain permits, and pay all required fees.
- D. Contractor shall make detailed examination of such property at start of work. Conditions shall be noted by the Contractor and confirmed by Owner.
 - 1. If damaged by this work, Streets, sidewalks and curbs, and other existing improvements therein adjacent to site, shall be repaired by Contractor at intervals as needed. At completion of project, all such items not included in Contract shall be left in condition at least equal to that at start of operations.
 - 2. Repair work shall conform to requirements of public authorities having jurisdiction. This includes, but is not restricted to, temporary walks for pedestrians, cleaning of mud and debris, air pollution control, and traffic control.
- E. Parking and Traffic Regulations: Persons involved in construction operations shall comply with parking and traffic regulations. Contractor shall provide 2 parking spaces on-site for Owner and Architect personnel.
- F. Existing Improvements in Sidewalks and Streets: Existing street signs, electroliers, traffic signals, fire hydrants, underground valves and meter boxes, manholes, trees and other items occurring in sidewalk areas or in streets adjacent to the site shall be left undisturbed, unobstructed, and easily accessible at all times during construction, except as otherwise indicated or agreed to between Contractor and Owner.
 - 1. Covering, moving, trimming, or altering which may become necessary shall be done only with consent of and in cooperation with Owner. Contractor shall pay costs which may be incurred.
- G. Protection of Owner-Owned Trees and Shrubs: Existing Owner-owned trees and shrubs to remain shall not be injured during the course of this work.
 - 1. Irrigate trees and shrubs, which are to remain within work area as directed by Owner; also, construct suitable earth berms around such trees and shrubs as necessary to hold irrigation.
 - 2. If any tree or shrub during the course of, or as a result of construction operations is injured to extent of causing its permanent disfigurement or death within the one year guarantee period, it is agreed by the parties to this Contract that actual damage to the Owner will be impossible to determine, and in lieu thereof, Contractor shall replace the tree or shrub at no cost to the Owner.
- H. Existing Utilities: Utility service lines found entering site and not indicated to remain or to be incorporated in new work, shall be plugged, capped, or otherwise abandoned by Contractor in manner satisfactory to Utility Companies whose services are involved, except as otherwise required.
 - 1. Protect from damage, existing utility lines not specified to be altered by work of this Contract; any such features damaged shall be repaired or replaced to condition equal to that existing prior to commencing work of this Contract. (See "Site Clearing", Section 31 10 00).
 - a. SIGNS
- I. Project Sign: Design, fabricate and install a Project Sign on the Project site. The location of the sign shall be reviewed and approved by the Owner prior to installation.
 - 1. The 4 feet by 8 feet sign shall be painted with a white background, MDO material, digital printing and vinyl graphics, mounted on posts where the bottom of the sign shall be a minimum height of 4 feet above the ground.
 - 2. Include as a minimum: the Owner, title of the project, team participants, logos, and scheduled completion ("Coming Spring 2026" – as an example). Discuss contents of the sign with Owner and submit shop drawings of the proposed sign graphics and lettering for the Owner's approval prior to fabrication. Maintain sign throughout duration of the Project and remove sign at the completion of the Project.

- J. Identification Sign for Owner Field Office: Furnish and install sign about 18" x 24" size. Sign material, lettering and mounting location as directed by Owner.
- K. Other Signs or Advertising: Not permitted, except that Contractor's name may be placed on Contractor's field office.

1.11 CLEAN UP OF WORK AND DISPOSAL OF TRASH

- A. Attention of Contractor is directed to Specification Section 01 74 00. Keep work and storage areas clean and free of rubbish and perform protective and clean-up work within one (1) day of being so notified by Owner.
- B. Dispose of trash resulting from work, off Owner property, as it accumulates. Pay fees required for use of public dumps. Burning on Owner property is prohibited.

1.12 NOISE AND DUST ABATEMENT

- A. Accomplish noisy operations with least inconvenience to adjacent businesses, residences or other occupancies.
- B. Use water wagons or spray from hoses to control dust created by outdoor work operations in areas on Owner property during entire period of this Contract as directed by Owner; also, satisfactorily control dust created by operations on property used, other than Owner property, to satisfaction of all concerned.

1.13 SANITARY FACILITIES

- A. Toilet Facilities: Provide sufficient suitably enclosed chemical toilets, conforming to ANSI Z4.3., with urinal for workmen. Locate facilities where directed by Owner.
- B. Washing Facilities: Provide properly mounted and adequate wash sinks connected to water supply. Locate sinks where directed by Owner.
- C. Drinking Water Facilities: Provide clean, sanitary and adequate drinking water.

1.14 TEMPORARY HEAT

- A. Provide and pay all costs for temporary heat, including equipment, fuel, and operators which may be required during Contract time to provide adequate temperatures for storage, application, and drying of installed materials.
 - 1. Provide temporary closures for windows and doors, and temporary general building ventilation, for proper storage and drying of materials and safe working conditions.
 - 2. Areas in which gypsum wallboard will be applied shall be properly ventilated and, if necessary, heated until ambient temperature in range 55 to 70 degrees Fahrenheit is maintained, day and night during and 24 hours before and after application.
- B. Use of Permanent Heating and Cooling System for Temporary Heat or Cooling:
 - 1. Agreement for Use: Permanent heating and cooling system shall not be used for temporary heating or cooling until it has undergone operational testing and is approved by the Owner. No demand shall be made by Contractor for use of permanent heating or cooling system for temporary heat or cooling, except with consent of Owner and by agreement in writing for use mutually acceptable to Owner and Contractor.
 - 2. Operation and Maintenance: Provide operator, maintain permanent system, and continue to do so during entire time temporary heat or cooling is required, and until entire Work of this Contract is accepted by Owner. Maintenance shall include replacement of filters and other dispensable items.
 - a. Refer to technical specifications for requirements relating to replacement of filters and other items used for temporary heating.
 - 3. Payment for Use: Cost of fuel, operators, and maintenance for permanent heating and cooling system shall be borne by Contractor until acceptance of building by Owner.

1.15 TEMPORARY ELECTRICAL FACILITIES

- A. Provide new temporary electrical facilities for temporary lighting and power during performance of work of this Contract as needed and in accordance with requirements specified below.

- B. Location of Temporary Electrical Facilities: Before temporary electrical facilities are installed either by utility company or Contractor, exact location of such facilities shall be agreeable to Owner. It is essential that facilities be located so as not to interfere with crane placement, materials handling or storage, traffic areas, later project construction or site development, other contracts, or subsequent work.
- C. Construction Requirements: Construct and maintain temporary electrical facilities in accordance with California Code of Regulations, Title 24, Part 3, Basic Electrical Regulations, Owner Building Standards Electrical Code, Public Utilities Commission "Rules for Overhead Line Construction" (G.O.95), and requirements of utility company providing service. Materials, devices, and equipment used for these facilities shall be in good and safe condition, but need not be new.
- D. Specific Requirements for Temporary Electrical Facilities:
1. Temporary Service: Contractor shall coordinate power needs and service connection with utility provider. Contractor shall be responsible for connection to utility provided electrical facilities. Contractor shall provide all necessary electrical facilities and their maintenance for specified limited temporary power up to, and including field office service heads, and electrical power centers as defined below.
 2. Pay temporary service installation and removal charges by serving utility company.
 3. Temporary Service Capacity and Distribution: Provide power capacity and distribution of specific characteristics and requirements as follows:
 - a. Service capacity, except as otherwise indicated, shall be based on 1/2 watt per sq. ft. of Project total building area, plus 30 amp, single phase, 3 wire, 120/240 volt circuit capacity (7200 watts) for each field office (and for each additional required power center beyond those required by square foot formula, i.e., power centers at remote areas such as water tanks, etc.)
 - b. Feeder capacity to serve power center shall be based on 1-1/2 watt minimum energy per sq. ft. with minimum 115 volts at power centers under normal use.
 - c. Power centers as defined herein shall be located throughout building construction area so that in actual areas of construction, centers are located 100 feet max apart and each serving 10,000 sq. ft. max of actual building floor area or construction activity area. (At detached areas requiring power, such as sewage plant facilities, water tanks, pump house, etc., one power center minimum shall be installed in each case.)
 - d. Each distribution box shall have six 20 amp, 120 volt, 3 pole grounded, and one 20 amp, 240 volt, 4 pole grounded twist lock outlets, each with circuit breaker protection.
 4. Temporary Branch Circuits: Provide electrical facilities for temporary power and lighting beyond service head for Owner field office, and power centers to provide sufficient illumination and wiring to meet construction needs, including branch circuit cords, or wiring, lamp holders, lamps, receptacles, etc.
 - a. Provide branch circuit light and power facilities of specific characteristics and requirements as follows:
 - b. Lighting branch circuit shall be based on a minimum 1/2 watt incandescent lighting per sq. ft. of floor area with lamp socket voltage maintained at 110 volts or more. Work areas shall be sufficiently illuminated to permit proper and safe conduct of construction activities, as determined by Owner.
 - c. Power branches shall provide necessary portable cord circuits from power centers so that receptacle outlets for power driven tools are available whenever needed without having to use more than 20 feet extension cord with tool. Extension cords shall be furnished by owner of tool being used.
 5. Payment for Energy Used: Contractor shall pay utility all costs for energy used.
- E. Contractor-Installed Construction Power Facilities: Temporary electrical materials and equipment furnished and installed by Contractor for required facilities hereunder shall be removed after serving their purpose.

1. If Owner should desire to retain portion of Contractor-Installed construction power system, it will be acquired as Change in Work.
- F. Utility Company-Installed Construction Power Facilities: Contractor shall not retain any vested interest in temporary electrical facilities installed by utility company as part of his requirements under this Contract, even though he may be required to pay utility company "Up and Down" charges for necessary facilities.
 1. These facilities may simultaneously or subsequently be used to other contract or construction work in project area, at Owner's discretion, with no change in contract price or rebate of any kind payable to Contractor by Owner or by any other party making use of such utility company-installed temporary facilities.
 2. Contractor shall be responsible for initial utility service (as specified in foregoing paragraph B of this Article) to site of Work.
 3. Other Contractors performing work for this Project may subsequently be served through any utility company installation existing on site with no additional charges, except payment to utility company for incremental "Up and Down" costs for extension of facilities required for any particular service.
 4. Contractor for Work of this Contract, or other Prime Contractors performing work for this project, shall notify utility company to remove their temporary facilities when no longer needed for Contract work, unless requested by Owner in writing to leave such facilities in place for subsequent construction needs.
- G. Use of Permanent Electrical System for Temporary Light and Power: Permanent electric system shall be installed in time to provide adequate lighting and power for testing, adjusting, and inspecting permanent heating and cooling system and work of other prime contractors performing work for this project who may be dependent thereon prior to completion of their contracts.
 1. Upon agreement by parties concerned, Owner may permit operation or use of portion of permanent electrical system to provide light and power during remaining construction period. Use of permanent electric system shall be subject to regulation by Contractor so as not to interfere with safety or orderly progress of Contractor's work.
 2. When permanent electric facilities are ready to be energized, Contractor shall make application to utility company for service and shall pay power and energy charges until project is accepted by Owner.
- H. Use of Engine Generator Sets: Where economics, time, or other factors indicate advisability of using engine generator sets for construction power in lieu of utility company supply, such source of power may be used.
 1. Use of engine generator sets shall be subject to Owner approval, but Owner will not be responsible for extra costs occasioned thereby.
 2. Use of engine generator shall comply with all air quality and emission regulations.
 3. Generators may not be used for nighttime work between the hours of 5:00 PM and
 - a. 8:00 AM due to proximity of residential area.

1.16 DEWATERING FACILITIES

- A. Provide and maintain dewatering and pumping facilities as needed to keep site reasonably dry, and to protect materials and installed work from water damage until dewatering is no longer required.
 1. Dewatering facilities provided by contractor for work of previous contract, will be used by that contractor until completion of that Contract. At such time, that contractor will remove portable dewatering facilities from site, and Contractor for Work of this Contract shall assume responsibility for keeping site dewatered. Coordinate changeover to prevent lapse of protection.
 2. Remove dewatering facilities from site when no longer needed.
 3. All fees associated with dewatering, its associated permits and fees shall be paid by the contractor.

1.17 SECURITY

- A. Contractor is responsible for security of building and grounds involved in this Project, during entire time of Contract. Make good all damages to work and loss of materials and equipment, including the Owner's Field Office, due to vandalism or theft, within this responsibility.

1.18 ENVIRONMENTAL REQUIREMENTS

- A. Air Quality – Also see Appendix A, CEQA Documentation.
 - a. The following measures at a minimum are required for the control of fugitive dust:
 - 1) Cover all trucks hauling soil, sand, and other loose materials to maintain at least 2 feet of freeboard.
 - 2) Sweep (with water sweepers) all paved access roads, parking areas, and staging areas at construction site as needed.
 - 3) Sweep street (with water sweepers) if soil is visible on adjacent streets.
 - 4) Limit traffic speeds on unpaved roads to 15 mph unless noted otherwise
 - b. The following measures are required for the control of vehicle emissions:
 - 1) Reduce idling of internal combustion engines to an absolute minimum
 - 2) Maintain construction equipment properly and tune engines to minimize exhaust emissions.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION

**SECTION 01 55 00
VEHICULAR ACCESS AND PARKING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Access roads.
- B. Parking.
- C. Existing pavements and parking areas.
- D. Construction parking controls.
- E. Flag persons.
- F. Haul routes.
- G. Traffic signs and signals.
- H. Maintenance.
- I. Removal, repair.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide temporary daily storage area as specified in product specification sections, for materials for permanent construction, including earthwork equipment.
 - 1. Contractor to schedule daily or weekly delivery of materials due to limited space on site.

2.02 SIGNS, SIGNALS, AND DEVICES

- A. Stock Post Mounted and Wall Mounted Traffic Control and Informational Signs:
- B. Automatic Traffic Control Signals: As approved by local jurisdictions.
- C. Traffic Cones and Lights: As approved by local jurisdictions.
- D. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.02 ACCESS ROADS

- A. Tracked vehicles not allowed on paved areas.
- B. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space.
- C. Provide and maintain access to fire hydrants free of obstructions.

3.03 PARKING

- A. Use of existing parking facilities by construction personnel is not permitted.
- B. Arrange for temporary parking areas to accommodate use of construction personnel.

3.04 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
- B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to emergency vehicle access or in non-designated areas.

3.05 FLAG PERSONS

- A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroaches on public traffic lanes.

3.06 HAUL ROUTES

- A. Consult with The City, establish public thoroughfares to be used for haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.07 MUD WASHING AREA

- A. Provide an area near the exit from the site where vehicles' tires may be washed so as not to transfer mud and debris from the jobsite to public roads.
 - 1. Provide a raised, well-drained area, with water of sufficient pressure to remove mud and debris from the tires and undercarriage of the vehicle.

3.08 TRAFFIC SIGNS AND SIGNALS

- A. Install and operate automatic traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.

3.09 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition, free of excavated material, construction equipment, and products.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.10 REMOVAL, REPAIR

- A. Repair existing facilities damaged by use, to specified condition.
- B. Remove equipment and devices when no longer required.
- C. Repair damage caused by installation.

END OF SECTION

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Erosion control shall consist of, but not limited to, constructing such permanent and temporary facilities and taking such measures as are necessary to prevent, control and abate water, mud, and erosion damage to public and private property as a result of the construction of this project.
- B. Erosion control shall apply year-round to all areas where earthen material is exposed on the project site.
- C. See the Project SWPPP for compliance requirements.

1.02 REFERENCES

- A. American Society for testing and Materials:
 - 1. ASTM D-4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
- B. Section 20 of the California Department of Transportation Standard Specifications (Standard Specifications).
- C. State Water Resources Control Board (SWRCB) Order 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Associated with Construction Activity.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Straw Bales: Straw for bales shall be noxious weed free and shall be derived from wheat, rice or barley.
- B. Silt Fencing: Filter fabric shall be a pervious sheet of synthetic polymer composed of at least 85% by weight ethylene, propylene, amide, ester, or vinylidene yarn, woven or non- woven. It shall contain stabilizers and/or inhibitors to resist deterioration by heat, water, and ultra-violet light. The fabric shall conform to the following:
 - 1. The equivalent opening size (U.S. Standard Sieve) shall be within the range 70- 100.
 - 2. The tensile strength (per ASTM D4632) shall be at least 120 pounds.
 - 3. Silt Fencing Posts: Posts for silt fences shall be either 4 inch diameter wood or 1.33 pounds per linear foot steel with a minimum length of 3 feet. Steel posts shall have projections for fastening wire to them.
- C. Drain Rock: Drain rock for sediment basin shall be hard, durable, gravel or crushed stone, and shall be free from organic material, clay balls, or other deleterious substances. Material shall have 100% passing the 2 inch sieve, 95-100% passing the 1-1/2 inch sieve, 50-100% passing the 3/4 inch sieve, and 0% passing the No. 4 sieve.
- D. Rock for Construction Entrance: The material for the construction of the pad for the construction entrance shall be 2 to 3 inch crushed stone.
- E. Rock Rip-Rap: Rock rip-rap at pipe inlets/outlets and ditches shall be composed of a well graded mixture of hard and angular rock down to the 1 inch size particle such that 50% of the mixture by weight shall be larger than a d50 size of 9 inches. The diameter of the largest rock shall be 15 inches.
- F. Wattle: Fiber rolls composed of compostable material.
- G. Re-vegetation: All disturbed areas not covered with new planting shall be re-vegetated with a seed mixture designed by a qualified Engineer or Landscape Architect. A granular fertilizer (16-20-0) shall be broadcast with the seed at a rate of 500 lbs./acre. If hydro-seeding is used, a minimum of 535 lbs. of fiber per acre shall be mixed and applied with seed and fertilizer.

PART 3 - EXECUTION

3.01 SCHEDULE

- A. Construction or implementation of erosion control measures shall be performed year round.

END OF SECTION

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Identification of Owner-supplied products.
- B. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 01 30 00 - Administrative Requirements.
- D. Section 01 35 10 - Sustainability (CAL Green) Requirements: Requirements for VOC-restricted product categories.
- E. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- F. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

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

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Owner and Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not re-used, relocated, reinstalled, delivered to the Owner, or not to remain the property of the Owner, become the property of the Contractor. Remove from site.

- D. Specific Items to be Reused: The reuse of certain materials and equipment already existing on the project site will be listed by the owner for relocation during construction.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. See Section 01 40 00 - Quality Requirements, for additional source quality control requirements.
- C. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Made of wood from newly cut old growth timber.
 - 3. Containing lead, cadmium, or asbestos.
- D. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
 - 3. Result in less construction waste. See Section 01 74 19
 - 4. Are made of recycled materials.
 - 5. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named, allowed under the provisions of Section 01 25 00 Substitution Procedures, and based on Owner and Architect approval.
- D. Products Specified as Basis-of-Design: Submit substitution requests for unnamed products to Architect for evaluation.

2.04 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
 - a. Provide documentation for inclusion in the Operation and Maintenance manual.
 - b. Provide instruction for Demonstration and Training if required.
- B. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.

2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

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

3.04 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed conveniently to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities and value, and provide that information monthly when submitting for payment.
- F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G. For exterior storage of fabricated products, place on sloped supports above ground.
- H. Provide off-site storage and protection when site does not permit on-site storage or protection.
- I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- J. Comply with manufacturer's warranty conditions, if any.
- K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- L. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- M. Prevent contact with material that may cause corrosion, discoloration, or staining.
- N. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- O. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

**SECTION 01 64 00
OWNER FURNISHED PRODUCTS**

PART 1 GENERAL

1.01 REQUIREMENTS RELATED TO OWNER-FURNISHED PRODUCTS.

- A. Summary: States that the owner will provide specific products, typically identified on drawings or in other technical sections as "OFOI".

1.02 DEFINITIONS:

- A. OFCI (owner-furnished contractor-installed): products furnished by the owner for installation by the contractor.
- B. OFOI (owner-furnished owner-installed): products provided and installed by the owner, but potentially requiring contractor preparation for installation.
- C. NIC (not in contract): products provided and installed by the owner, requiring no contractor preparation.

PART 2 PRODUCTS

2.01 FURNITURE, FIXTURES AND EQUIPMENT

- A. Items to be removed prior to demolition, stored for the duration of construction, and reinstalled by the Owner are scheduled in the drawings on sheet A6.6.

PART 2 EXECUTION

3.01 OWNER'S RESPONSIBILITIES:

- A. Owner will remove items from the property and store them at their own expense prior to demolition.
- B. Owner will install items when construction is complete.

3.02 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor has no responsibilities for OFOI on this project.

END OF SECTION

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**SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for alterations work, including selective demolition.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying and protection of the survey points.
- E. Starting of systems and equipment.
- F. Demonstration and instruction of Owner personnel.
- G. Closeout procedures, including Contractor's Correction Punch List.
- H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- D. Section 01 71 23 - Field Engineering: Additional requirements for field engineering and surveying work.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- F. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- G. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- H. Section 02 41 00 - DEMOLITION: Demolition of whole structures and parts thereof; site utility demolition.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 DEFINITIONS

- A. Concealed Spaces: Spaces which are not accessible after completion of construction.
- B. Cutting: Removal of material by cutting, sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation.
- C. Damage: Any sort of deterioration whether due to weather, normal wear and tear, accident, or abuse, resulting in soiling, marring, breakage, corrosion, rotting, or impairment of function.
- D. Debris: Rubbish, waste materials, litter, volatile wastes, and similar materials, with the exception of surplus materials which are to become the property of the Owner.
- E. Operational Elements: Equipment, moving parts, electrical conductors, sound and vibration control materials, waterproofing, vapor retarders, piping, ducts, tanks, and other similar materials and components which convey or retard the passage of liquids, gases, heat, light, persons, animals, or insects or which perform a similar function; not including structural elements

- F. Patching: Restoration to completed condition by patching, repairing, finishing, filling, closing up, and similar operations.
- G. Replacement: Replace the entire element, surface, or product.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
 - a. Provide safety barricades, warning lights, or signs as required to inform personnel and the public of the hazard being protected against.
 - b. Provide temporary walkways where walking surfaces are hazardous.
 - c. Provide construction fencing to secure entire site area.
- D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- E. Include in Submittal:
 - 1. Identification of Project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed work and products to be used.
 - 5. Effect on work of Utility Company or separate Contractor.
 - 6. Written permission of affected separate Contractor.
 - 7. Date and time work will be executed.
- F. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.06 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of 5 years of documented experience.
- B. For surveying work, employ a land surveyor registered in the State of California and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

1.07 PROJECT CONDITIONS

- A. Conduct construction operations so that no part of the work is subjected to damaging operations or influences which are in excess of those to be expected during normal construction conditions.
- B. Use of explosives is not permitted.
- C. Take precautions to prevent fires and to facilitate fire-fighting operations.
 - 1. Keep flammable materials in non-combustible containers; store away from potential fire sources; remove flammable waste regularly.
 - 2. Keep temporary and permanent fire fighting facilities readily accessible; keep fire fighting routes open.
 - 3. Do not allow smoking in areas where highly combustible or explosive materials are present.
 - 4. Carefully supervise the operation of potential fire sources, including heating units.
 - 5. Conduct welding operations in manner to prevent fire; comply with local regulations.
- D. Perform dewatering activities, as required by Section 31 23 19 - Dewatering, for the duration of the project.
 - 1. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- G. Take care to prevent pollution of air, water, and soil. Comply with environmental protection regulations.
 - 1. The Contractor shall comply with all applicable standards, orders or requirements of the Clean Air Act of 1970, including but not limited to Section 306 (42 U.S.C. 7606), Executive Order 11738, prohibiting contracting with Clean Air Act violators; and Sections 608 and 609 (42 U.S.C. 7671g, 7671h) as amended November 15, 1990, prohibiting the intentional release of chlorofluorocarbons into the environment when performing work specified by the contract.
 - 2. The Contractor shall comply with all applicable standards, orders, or requirements issued under Section 508 of the Clean Air Act (33 U.S.C 1368) Executive Order 11738.
 - 3. The Contractor shall exercise extreme care when excavating adjacent to existing utilities. The Contractor shall include in his bid all labor and materials necessary to protect existing utilities. If no pay item is provided in the contract for this work, full compensation for such work shall be considered as included in the prices bid for other items of work.
- H. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. The Contractor shall comply with all applicable standards, orders or requirements of the Base regarding "Stormwater Management and Discharge Control", prohibiting the discharge of non-stormwater to a stormwater conveyance system.
 - 2. The Contractor shall comply with all applicable standards, orders, or requirements of the Flood Disaster Protection Act of 1973 (42 USC 4001 et seq, as amended).
 - 3. Minimize amount of bare soil exposed at one time.
 - 4. Prevent erosion due to rainwater runoff.

5. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
 6. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
 7. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 8. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 9. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- I. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 1. At All Times: Excessively noisy tools and operations will not be tolerated on site anywhere at any time of day; excessively noisy includes pile drivers and diesel engines or generators running for long periods of time.
 - a. Outdoors: Limit especially noisy exterior work to the hours of 8 am to 5 pm.
 - b. Indoors: Limit especially noisy interior work to 8 am to 5 pm.
 - J. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
 1. Pest Control Service: Treatments as required by local conditions to maintain a clean and safe worksite.
 - K. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
 - L. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.08 COORDINATION

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

1.09 ILLNESS AND INJURY PREVENTION PROGRAM

- A. The Contractor shall comply with all the mandates of Senate Bill 198 and specifically shall have a written Injury Prevention Program in accordance with all applicable standards. This Program shall be on file at time of Notice of Award of Contract.

1.10 GRAFFITI CONTROL

- A. The Contractor shall maintain all site improvements, including any temporary facilities, equipment or other materials in a graffiti free condition throughout the construction period, until acceptance of the project by the Owner. Graffiti encountered on the job site shall be removed by the Contractor within twenty-four (24) hours.

1.11 SEQUENCING AND SCHEDULING

- A. Install products only at the time and in the sequence which will ensure the best possible results.
- B. Coordinate required administrative activities with related construction activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Start of work means acceptance of existing conditions.
 - 1. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
 - 1. The existence and location of construction indicated as existing on the drawings are not guaranteed. In particular, verify the following:
 - a. Underground utilities.
 - b. Other underground construction.
 - c. Location of points of connection and invert elevation to piped utilities.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
 - 1. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding.
 - 2. Conditions which could have been discovered by examination will not be allowed as cause for claims for extra work.
- G. Verify that utility requirements of operating equipment are compatible with building utilities.
- H. Verify space requirements of items which are shown diagrammatically on the drawings.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.

- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

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

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
 - 1. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
 - 4. Controlling lines and levels required for mechanical and electrical trades.
- I. Periodically verify layouts by same means.
- J. Maintain a complete and accurate log of control and survey work as it progresses.
- K. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

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

3.06 ALTERATIONS

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
Execution and Closeout
Requirements
01 70 00 -6

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Maintain temporary enclosures over the work except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Relocate items indicated on drawings.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Access Control): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

3.07 CUTTING AND PATCHING PROCEDURES

- A. Perform cutting and patching at earliest time feasible, unless otherwise indicated or directed by the Owner.
- B. Employ skilled workers to perform cutting and patching work. Use the original installer of the work to perform cutting and patching.
- C. Do not cut and patch in a manner that would result in substantial visual evidence of cut and patch work.
 - 1. Remove and replace work which is patched in a visually unacceptable manner.
 - 2. For continuous surfaces, extend refinish to nearest intersection, with a neat transition to adjacent surfaces.
 - 3. For assemblies: Refinish entire unit.
 - 4. Painted piping, conduit, and duct: Clean and repaint.
- D. Refinish existing surfaces as indicated:
 - 1. Refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- E. Clean existing systems and equipment.

- F. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- G. Do not begin new construction in alterations areas before demolition is complete.
- H. Comply with all other applicable requirements of this section.

3.08 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.09 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 79 00 - Demonstration and Training.

3.10 ADJUSTING

- A. After System Startup, adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems under the provisions of Division 23.

3.11 FINAL CLEANING

- A. See Section 01 74 00 - Cleaning.
- B. Execute final cleaning after Substantial Completion but before making final application for payment.
- C. Use cleaning materials that are nonhazardous and recommended by the manufacturer.
- D. Clean or replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.

3.12 CLOSEOUT PROCEDURES

- A. Provide Closeout documents according to the provisions of Section 01 78 00 - Closeout Submittals
- B. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- C. Accompany Architect on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- D. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- E. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

- F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

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

END OF SECTION

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**SECTION 01 71 23
FIELD ENGINEERING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Land surveying services by Contractor.
- B. Boundary demarcations.
- C. Construction surveying by Contractor.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements
- B. Section 01 70 00 - Execution and Closeout Requirements
- C. Section 01 78 00 - Closeout Submittals

1.03 DESCRIPTION OF SERVICES

- A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.
- B. Sole responsibility for establishing all locations, dimensions and levels of items of work.
- C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.
- D. Having a skilled instrument person(s) available on short notice when necessary for laying out the work.
- E. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.
- F. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.
 - 1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.
- G. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.
- H. Prior to backfilling operations, surveying - locating, and recording on a copy of Contract Documents - an accurate representation of buried work and Underground Facilities encountered.

1.04 REFERENCE STANDARDS

- A. FGDC-STD-007.1 - Geospatial Positioning Accuracy Standards - Part 1: Reporting Methodology; 1998.
- B. FGDC-STD-007.2 - Geospatial Positioning Accuracy Standards - Part 2: Standards for Geodetic Networks; 1998.
- C. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement; 2002.
- D. State Plane Coordinate System for the State in which the Project is located.

1.05 SUBMITTALS

- A. Informational Submittals: Submit the following:
 - 1. Field Engineering: Submit reports, with content as indicated in this section.

- a. When requested by Architect, submit for Record documentation verifying accuracy of field engineering including, but not limited to, Contractor's survey notes and field notes.
- 2. Final property survey.

1.06 QUALITY ASSURANCE

- A. Land Surveyor's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.
- B. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.
- C. Minimum accuracy for required work is as follows:
 - 1. Grade: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
 - 2. Culverts and ditches: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
 - 3. Structures: Horizontal Tolerance: Plus or minus 0.1 feet (location), Vertical Tolerance: Plus or minus 0.05 feet.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify layout information shown on drawings in relation to property survey and existing benchmarks.
- B. Notify Owner's representative and Architect of discrepancies immediately in writing before proceeding to lay out work.
- C. Locate and protect existing benchmarks, base lines, and demarcations. Preserve permanent reference points during construction.
- D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.02 LAND SURVEYING

- A. General: Follow standards for geospatial positioning accuracy.
 - 1. FGDC-STD-007.1 as amended by Authority Having Jurisdiction.
 - 2. FGDC-STD-007.2 as amended by Authority Having Jurisdiction.
 - 3. FGDC-STD-007.4 as amended by Authority Having Jurisdiction.
- B. Coordinate survey data with the State Plane Coordinate System of the State in which the Project is located.
- C. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor's expense by a surveyor licensed in the State in which the Project is located, and approved by the Architect.
 - 1. Temporarily suspend work at such points and for such reasonable times as the Owner may require for resetting monuments. The Contractor will not be entitled to any additional compensation or extension of time.

3.03 BOUNDARY DEMARCATIONS

- A. Wetlands: Protect demarcations and areas from disturbance as indicated on drawings.
- B. Species Habitat: Protect demarcations and areas from disturbance as indicated on drawings.
- C. Historic Archaeology: Protect demarcations and areas from disturbance as indicated on drawings.
- D. Undisturbed: Protect demarcations and areas from disturbance as indicated on drawings.

3.04 CONSTRUCTION SURVEYING

- A. General: Perform surveying as applicable to specific items necessary for proper execution of work.
 - 1. Alignment Staking: Provide alignment stakes at 50 foot intervals on tangent, and at 25 foot intervals on curves.
 - 2. Slope Staking: Provide slope staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. Re-stake at every ten-foot difference in elevation.
 - 3. Structure: Stake out structures, including elevations, and check prior to and during construction.
 - 4. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.
 - 5. Road: Stake out roadway elevations at 50 foot50-foot intervals on tangent, and at 25 foot intervals on curves.
 - 6. Cross-sections: Provide original, intermediate, and final staking as required, for site work and other locations as necessary for quantity surveys.
 - 7. Easement Staking: Provide easement staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. If required by project conditions, provide wooden laths with flagging at 100 foot intervals.
 - 8. Record Staking: Provide permanent stake at each blind flange and each utility cap is provided for future connections. Use stakes for record staking of material(s) acceptable to Architect.
 - 9. Structural Frame: Upon completion, certify location and plumbness.
- B. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.
- C. Accuracy:
 - 1. Establish Contractor's temporary survey references points for Contractor's use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
 - a. Accuracy of Other Staking: Plus/minus 0.04 foot horizontally and plus/minus 0.02 foot vertically.
 - b. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
 - 2. Owner reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.05 RECORDS

- A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
 - 1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State in which the Project is located. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by Owner due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.
 - 2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.

- B. Submit three copies of final property survey to Owner. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:
1. Structure locations from property lines, and distances to adjacent buildings.
 2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, and major site features.
 3. Location of easements.
 4. Final grading topographic survey.

END OF SECTION

SECTION 01 74 00 CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Perform cleaning and disposal work as specified, complete. This Section forms a part of all other Sections of the specifications and shall be coordinated with such additional cleaning and disposal requirements as may be specified in other Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 74 19 - Construction Waste Management.
- B. Section 01 35 10 - Sustainability (CAL Green) Requirements
- C. Section 01 35 46 - Construction Indoor Air Quality Management.
- D. Pertinent Specification Information: Manufacturer's requirements for cleaning.

PART 2 - NOT USED

PART 3 - EXECUTION

3.01 GENERAL CLEANING

- A. At all times, Project working area and site shall be kept clean and orderly. Dirt, debris, waste, rubbish and disused implements and equipment shall be removed frequently and not allowed to accumulate more than 24 hours. Flammable and toxic materials shall not be stored in structures.
- B. Waste material or rubbish caused by Contractor's employees or work, or employees or work of subcontractors shall be removed from and about areas of Work and Contractor's and subcontractors' tools, scaffolding and surplus materials, and shall leave the Work "broom clean", or its equivalent. In case of dispute between Contractor and sub-contractors employed on or about the work areas as to responsibility for removal of rubbish, etc., or in case debris is not promptly removed as herein required, the Owner may remove rubbish, etc., and back charge the Contractor.

3.02 PROGRESS CLEANING

- A. General:
 - 1. Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 2. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 3. Do not hold materials in waste receptacles more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 - 4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site:
 - 1. Maintain Project site free of rubbish, waste materials and debris.
- C. Work Areas:
 - 1. Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 2. Remove liquid spills promptly.
 - 3. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work:
 - 1. 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:
 - 1. Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas:
 - 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Completion.
 - 2. Waste Disposal:
 - a. Burying or burning waste materials on-site will not be permitted.
 - b. Washing waste materials down sewers or into waterways will not be permitted.
- G. Progress Cleaning:
 - 1. 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 Completion.
 - 2. 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.
- H. Limiting Exposures:
 - 1. Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.03 FINAL CLEANING

- A. Within Contract limits, clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
 - 1. Clean equipment and fixtures to sanitary condition, clean or replace filters of mechanical equipment.
 - 2. Clean roofs, gutters, downspouts and drainage systems.
 - 3. Glass: Clean all glass, interior and exterior, affected by Work of this Project; including removal of foreign material from glass.
- B. Clean site: Sweep paved areas, rake clean other surfaces.
- C. Remove waste and surplus materials, rubbish and construction facilities from Project and from site.
- D. Dust, dirt, stains, hand marks, paint spots, and like defects shall be completely removed from surfaces. Metal surfaces shall be cleaned, using only non-corrosive and non- abrasive materials.
- E. All site drain lines shall be cleaned of all dirt and debris from the work and disposed of. Flushing to adjacent creek is not permitted.
- F. Final Inspection: Deficient cleaning operations, as determined by the Owner, shall be immediately corrected as directed.

3.04 DISPOSAL

- A. Under no circumstances shall rubbish or waste material be disposed of in site fills or backfills. Debris, rubbish, and waste or surplus material shall be removed from the Owner property daily and legally disposed of.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Owner may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.
- E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood.
 - 5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
 - 6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
 - 7. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
 - 8. Asphalt paving: May be recycled into paving for project.
 - 9. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 10. Glass.
 - 11. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 - 12. Paint.
 - 13. Plastic sheeting.
 - 14. Rigid foam insulation.
 - 15. Windows, doors, and door hardware.
 - 16. Plumbing fixtures.
 - 17. Mechanical and electrical equipment.
 - 18. Acoustical ceiling tile and panels.
- F. The following recycling incentive programs are mandatory for this project; Contractor is responsible for implementation:
 - 1. Revenue or savings will accrue to Contractor.
- G. Develop and follow a Waste Management Plan designed to implement these requirements.
- H. The following sources may be useful in developing the Waste Management Plan:
 - 1. State Recycling Department.
 - 2. Recycling Haulers and Markets: The attached list contains local haulers and markets for recyclable materials. This list is provided for information only and is not necessarily comprehensive; other haulers and markets are acceptable.
 - 3. Recycling Economics Information: The attached list contains information that may be useful in estimating the costs or savings or recycling options.
- I. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.
 2. Burying on the project site.
 3. Dumping or burying on other property, public or private.
 4. Other illegal dumping or burying.
- J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
 - 1. Submit to Architect for Owner's review and approval.
 - 2. If Owner wishes to implement any cost alternatives, the Contract Price will be adjusted as specified elsewhere.
 - 3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
 - 4. Describe as many alternatives to landfilling as possible:
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the proposed local market for each material.
 - c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
- C. Once Owner has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect.
- D. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - c. State the estimated net cost, versus landfill disposal.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
 - 7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.
- E. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.

- c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
- 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
- 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- 6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
- 7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- F. Recycling Incentive Programs:
 - 1. Where revenue accrues to Contractor, submit copies of documentation required to qualify for incentive.
 - 2. Where revenue accrues to Owner, submit any additional documentation required by Owner in addition to information provided in periodic Waste Disposal Report.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 10 00 for list of items to be salvaged from the existing building for relocation in project or for Owner.
- B. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- D. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- E. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. As a minimum, provide:
 - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
 - b. Separate dumpsters for each category of recyclable.
 - c. Recycling bins at worker lunch area.
 - 2. Provide containers as required.
 - 3. Locate enclosures out of the way of construction traffic.
 - 4. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 5. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

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**SECTION 01 78 00
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.

2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 WARRANTIES AND BONDS

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

END OF SECTION

SECTION 01 78 23
OPERATIONS AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

- A. ASHRAE Guideline 4 - Preparation of Operations and Maintenance Documentation for HVAC&R Systems; 2019.

1.02 SUMMARY

- A. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Comply with Section 01 71 00, Contract Closeout Procedures, for schedule for submitting operation and maintenance documentation.
- C. Section Includes:
 - 1. Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - a. Operation and maintenance documentation directory.
 - b. Emergency manuals.
 - c. Operation manuals for systems, subsystems, and equipment.
 - d. Maintenance manuals for the care and maintenance of products, materials and finishes, systems, and equipment.

1.03 RELATED SECTIONS:

- A. Section 01 30 00 - Administrative Requirements
- B. Section 01 41 00 - Testing and Inspection
- C. Section 01 71 00 - Contract Closeout Procedures
- D. Section 01 78 00 - Closeout Submittals
- E. Section 01 78 36 - Warranties
- F. Section 01 78 39 - Project Record Documents
- G. Other Divisions and Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.04 DEFINITIONS

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

1.05 REQUIREMENTS

- A. Standard Operation and Maintenance (O&M) Manuals.
 - 1. The O&M Manuals will be submitted in both hard copy and electronic form. The electronic file will be bookmarked according to its Table of Contents.
 - 2. Owner Review and Approval. Prior to Approval, the Owner shall review the O&M Manuals, documentation, and redline as-builts to verify compliance with the Performance Criteria. The Owner will communicate deficiencies in the manuals to the Contractor. Upon a successful review of the corrections, the Owner recommends acceptance of these sections of the O&M manuals. The Owner also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated.

1.06 SUBMITTALS

- A. Initial Submittal:

1. Submit two (2) draft copies of each manual. The draft will be reviewed, approved, and corrections noted where applicable by the Owner.
 2. Combine in commercial quality 8-1/2" x 11" binders, with hardback, cleanable, plastic covers.
- B. Final Submittal:
1. Prior to the commencement of any training related activities, submit two (2) copies of each manual in final form.
 2. Provide Digital PDF copies of O & M Manuals with final submittal.

1.07 COORDINATION

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

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization:
1. In alphabetical order, include a Section in the directory for each system and include of the following:
 - a. Master table of contents for directory.
 - b. Table of contents for each system.
 - c. List of Manufacturer and Sales/Service contact information.
 - d. List of systems.
 - e. List of equipment.
 - f. Copy of Warranty for each system and/or piece of equipment.
 2. In each Operation and Maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Construction Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."
 3. All documents to be word searchable. Scanned images of text will not be acceptable.
 4. Organize into sets of manageable size. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 5. Binders: Heavy-duty, 3-ring, binders, with label describing contents.
 - a. Indicate volume number (and volume count) for multiple-volume sets.
 - b. Cross-reference other binders if necessary, to provide essential information for proper operation or maintenance of equipment or system.
 6. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. Label according to system.

2.02 EMERGENCY INFORMATION

- A. Emergency Instructions:
1. Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of the Owner for notification of Installer, supplier, and manufacturer to maintain warranties.
- B. Include emergency procedures for each of the following:
1. Type of Emergency: Where applicable for each type of emergency required below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - a. Fire.
 - b. Flood.

- c. Gas leak.
 - d. Water leak.
 - e. Power failure.
 - f. Water outage.
 - g. System, subsystem, or equipment failure.
 - h. Chemical release or spill.
- C. Emergency Procedures:
- 1. Include the following, as applicable:
 - a. Instructions on stopping.
 - b. Shutdown instructions for each type of emergency.
 - c. Operating instructions for conditions outside normal operating limits.
 - d. Required sequences for electric or electronic systems.
 - e. Special operating instructions and procedures.

2.03 OPERATION MANUALS

- A. In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
- a. System, subsystem, and equipment descriptions.
 - b. Performance and design requirement if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Operating procedures.
 - e. Operating logs.
 - f. Wiring diagrams.
 - g. Control diagrams.
 - h. Piped system diagrams.
 - i. Precautions against improper use.
 - j. License requirements including inspection and renewal dates.
- B. Descriptions:
- 1. Include the following:
 - a. Product name and model number.
 - b. Manufacturer's name.
 - c. Equipment identification with serial number of each component.
 - d. Equipment function.
 - e. Operating characteristics.
 - f. Limiting conditions.
 - g. Performance curves.
 - h. Engineering data and tests.
 - i. Complete nomenclature and number of replacement parts.
- C. Operating Procedures:
- 1. Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Instructions on stopping.
 - f. Normal shutdown instructions.
 - g. Seasonal and weekend operating instructions.
 - h. Required sequences for electric or electronic systems.
 - i. Special operating instructions and procedures.
- D. Systems and Equipment Controls:
- 1. Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems:

1. Diagram piping as installed, and identify color-coding where required for identification.

2.04 PRODUCT MAINTENANCE MANUAL

A. Product Information:

1. Include the following, as applicable:
 - a. Product name and model number.
 - b. Manufacturer's name.
 - c. Color, pattern, and texture.
 - d. Material and chemical composition.
 - e. Reordering information for specially manufactured products.

B. Maintenance Procedures:

1. Include manufacturer's written recommendations and the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Schedule for routine cleaning and maintenance.
 - e. Repair instructions.

C. Repair Materials and Sources:

1. Include lists of materials and local sources of materials and related services.

D. Warranties and Bonds:

1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
2. Include procedures to follow and required notifications for warranty claims.

2.05 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Manufacturers' Maintenance Documentation:

1. Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - a. Standard printed maintenance instructions and bulletins.
 - b. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - c. Identification and nomenclature of parts and components.
 - d. List of items recommended to be stocked as spare parts.

B. Maintenance Procedures:

1. Include test and inspection instructions, troubleshooting guide, precautions against improper maintenance.
2. Disassembly; component removal, repair, and replacement; and reassembly instructions.
3. Aligning, adjusting, and checking instructions.
4. Demonstration and training videotape, if available.

C. Maintenance and Service Schedules:

1. 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.
2. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
3. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

D. Spare Parts List and Source Information:

1. 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.
- E. Maintenance Service Contracts:
 1. Include copies of maintenance agreements with name and telephone number of service agent.
- F. Warranties and Bonds:
 1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 2. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory:
 1. Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual:
 1. Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by the Owner for types of emergencies required.
- C. Product Maintenance Manual:
 1. Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals:
 1. Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 2. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 3. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by the Owner.
 4. Prepare a recommended general overall preventative maintenance manual and include a schedule for use by the Owner.

END OF SECTION

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SECTION 01 78 36 WARRANTIES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. General Conditions of the Contract: Warranty, and Correction of Work.
- B. Section 01 30 00 - Administrative Requirements: Submittals.
- C. Section 01 78 00 – Closeout Submittals
- D. Section 01 78 23 - Operation and Maintenance Data.
- E. Individual Specifications Sections: Provision of warranties required for specific products or work.

1.02 FORM OF SUBMITTALS

- A. Form of Warranty: Written warranties, except manufacturer's standard printed warranties, shall be on the Contractor's, Subcontractor's, material supplier, or manufacturers own letterhead, addressed to the Owner. All warranties shall be submitted in duplicate, and in the format supplied with this section, modified as approved to suit the conditions pertaining to the warranty.
- B. Bind warranties in commercial quality 8 1/2" x 11" binders, with hardback, cleanable, plastic covers.
- C. Label cover of each binder with typed or printed title "WARRANTIES", with title of Project; name, address, and telephone number of Contractor; and name of responsible principal.
- D. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of Product or work item.
- E. Separate each warranty with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.03 PREPARATION OF SUBMITTALS

- A. Obtain warranties, executed in duplicate by responsible subcontractor, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, beginning of time of warranty will commence on the date of substantial completion.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. All warranties shall be signed by both the General Contractor and the appropriate subcontractor.
- D. Retain warranties until time specified for submittal.

1.04 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during construction with Owner/Architect's permission, submit documents within ten days after acceptance.
- B. Make other submittals prior to final Application for Payment.

1.05 WARRANTY REQUIREMENTS

- A. Contractor shall guarantee all work on the project against defective workmanship and materials for a period of one year from the date of Substantial Completion (unless longer warrantee times are indicated in specific sections of the specification).
 - 1. Contractor shall repair or replace any such defective work in manner satisfactory to the Owner.

1.06 PAYMENT

- A. Full compensation for the required warranties shall be considered as included in the contract price paid for the various items of work involved, and no additional compensation shall be allowed therefore.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

**END OF SECTION
(SEE NEXT PAGE)**

WARRANTY FOR WORK: _____

We, the undersigned, hereby warrant that work described above, which we have furnished and/or installed for the following project:

**City of Newport Beach – Fire Station 1 and Library
Newport Beach, California**

is in accordance with the Contract Documents and, as installed will fulfill or exceed all of the Warranty requirements. We agree to repair or replace our Work, together with any adjacent Work which is displaced or damaged by so doing, that proves defective in workmanship, material, or operation within a period of (1) year(s) from date of final acceptance of the project by the City or from the Date of Certificate of Substantial Completion, whichever is earlier. Ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with the above-mentioned conditions within a reasonable period of time, as determined by the City, after being notified in writing, we, the undersigned, collectively and separately do hereby authorize the City to have said defects repaired and/or replaced and made good, and to pay in discharging said Work, including all collection costs and reasonable attorney fees.

NAME: _____

(Subcontractor, Manufacturer, Supplier)

BY _____ TITLE _____

STATE LICENSE NO. _____ DATE: _____

NAME: _____

(CONTRACTOR)

BY _____ TITLE _____

STATE LICENSE NO. _____ DATE: _____

Local Representative to be contacted for maintenance, repair and/or replacement service:

NAME: _____

ADDRESS: _____

PHONE NO. _____

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SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Administrative and procedural requirements for Project Record Documents, including the following:
 - a. Record Drawings.
 - b. Record Specifications.
 - c. Record Product Data.
- B. Related Sections:
 - 1. Section 01 70 00 - Execution and Closeout Requirements
 - 2. Section 01 78 23 - Operations and Maintenance Data.
 - 3. Section 01 78 36 – Warranties.
 - 4. Other Divisions and Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.02 SUBMITTALS

- A. Record Drawings:
 - 1. Submit one (1) printed set of marked-up Record Prints with all project changes included.
 - 2. Submit one (1) printed set of As-Built Record CAD Drawings.
 - 3. Submit two (2) sets of Record-revised As-Built CAD Drawing files on electronic media, (AutoDesk software) one set locked, and one set unlocked and completely manipulate-able, and one set of As-Built drawings in PDF form on electronic media.
 - a. Label each electronic media disk to include Project Name, Owner Project Number, Project Location, and the files each disk contains.
- B. Record Specifications:
 - 1. Submit two (2) printed copies of the Project's Record Specifications, including addenda and contract modifications.
 - 2. Submit two (2) sets of Record Specifications on electronic media, one (1) set PDF, and one (1) set MS Word, unlocked and completely manipulate-able.
 - a. Label each electronic media disk to include Project Name, Owner Project Number, Project Location, and the files each disk contains.
- C. Record Product Data:
 - 1. Submit two (2) printed copies of each Product Data submittal.
 - a. Where Record Product Data is required as part of Operation and Maintenance Manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.
 - 2. Submit one (1) set of Record Product Data on electronic media in PDF format.
 - a. Label each electronic media disk to include Project Name, Owner Project Number, Project Location, and the files each disk contains.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

- A. Record Prints:
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

- b. Obtain and record data for modifications as soon as specific item of work is accomplished. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Owner'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 Construction Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Construction Drawings.
 - 4. Mark important additional information that was either shown schematically or omitted from original Construction Drawings.
 - 5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record CAD Drawings:
- 1. Immediately before inspection for Certificate of Completion, review marked-up Record Prints with Construction Manager. When authorized, prepare a full set of corrected CAD Drawings of the Construction Drawings to reflect Record/As-built conditions.
 - 2. Format: Autodesk AutoCAD or Revit (current version), operating in Microsoft Windows operating system. Same CAD program, version, and operating system as the original Construction Drawings. One (1) set of Record (As- Built) CAD files shall be locked for record purposes. The other set of Record (As- Built) CAD files shall be unlocked and completely manipulate-able for later use by the Owner for other project purposes.
 - 3. Incorporate changes and additional information previously marked on Record Prints and Shop Drawings as applicable. Delete, redraw, and add details and notations where applicable. Scanned .TIF, .PDF or other non-manipulate-able files are not acceptable as electronic copies.
- C. Newly Prepared Record Drawings:
- 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 - 2. Proper scale and scope of detailing and notations are required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
 - 3. Identification: As follows:
 - a. Project name.
 - b. Owner Project Number.
 - c. Project Location.
 - d. Date.
 - e. Designation "PROJECT RECORD DRAWINGS."

2.02 RECORD SPECIFICATIONS

A. Preparation:

1. Include approved Substitution Requests if specified products were not used.
2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
3. Note related Record Product Data and Record Drawings where applicable.

2.03 RECORD PRODUCT DATA

A. Preparation:

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

2.04 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Recording:

1. Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples:

1. Store Record Documents and Samples in the field office apart from the Construction Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Owner's reference during normal working hours.
2. Record Documents shall be updated for review prior to each review of the Contractor's Payment Application.

END OF SECTION

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**SECTION 01 79 00
DEMONSTRATION AND TRAINING**

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
- B. Draft Training Plans: Owner will designate personnel to be trained.
 - 1. Tailor training to needs and skill-level of attendees.
 - 2. Submit to Architect for transmittal to Owner.
 - 3. Submit not less than four weeks prior to start of training.
 - 4. Revise and resubmit until acceptable.
 - 5. Provide an overall schedule showing all training sessions.
 - 6. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
 - 4. Include Commissioning Authority's formal acceptance of training session.

1.03 QUALITY ASSURANCE

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

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

3.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- D. Provide training in minimum two hour segments.
- E. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- F. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- G. Product and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 - 10. Review spare parts and tools required to be furnished by Contractor.

11. Review spare parts suppliers and sources and procurement procedures.
- H. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

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SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Provider are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
 - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.
- C. The Commissioning Provider directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Provider's responsibilities.
- D. The Commissioning Provider is employed by Owner.

1.02 SCOPE OF COMMISSIONING

- A. The following are to be commissioned:
 - 1. HVAC Systems.
 - a. Contractors responsible for start-up, air balance, and other testing must be completed with these tasks prior to commissioning testing.
 - b. DDC (Direct Digital Control) System Point to Point, Calibration and Programming.
 - c. Execution of Functional Performance Testing Procedures.
 - d. Development of the Sequence of Operations Test Script.
 - 2. Plumbing Systems.
 - a. Testing and balancing of the domestic hot water system.
 - b. Execution of Functional Performance Testing Procedures.
 - c. Development of the Sequence of Operations Test Script.
 - 3. Electrical Systems, including:
 - a. Emergency power systems.
 - 1) Generator
 - 2) UPS System
 - 3) Automatic Transfer Switches
 - 4) Automatic Transfer Switch Bypass
 - b. Electronic Safety and Security:
 - 1) Access Control system.
 - c. Communications:
 - 1) Fire Alerting system.
 - 4. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.03 RELATED REQUIREMENTS

- A. Section 01 35 10-Sustainability Requirements (CALGreen).

- B. Section 01 70 00 - Execution and Closeout Requirements.
- C. Section 01 78 39 - Project Record Documents.
- D. Section 01 79 00 - Demonstration and Training: Scope and procedures for Owner personnel training.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 1. Divisions 22, 23 and 26 Contractors shall provide submittal documentation relative to commissioning.
 - 2. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Provider, unless they require review by Architect; in that case, submit to Architect first.
 - 3. Submit one copy to the Commissioning Provider, not to be returned.
 - 4. Make commissioning submittals on time schedule specified by Commissioning Provider.
 - 5. Submittals indicated as "Draft" are intended for the use of the Commissioning Provider in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable .rtf or .docx electronic format.
 - 6. As soon as possible after submittals made to Architect are approved, submit copies of approved submittals to Commissioning Provider.
- B. Product Data: If submittals to Architect do not include the following, submit copies as soon as possible:
 - 1. Manufacturer's product data, cut sheets, and shop drawings.
 - 2. Manufacturer's installation instructions.
 - 3. Startup, operating, and troubleshooting procedures.
 - 4. Fan and pump curves.
 - 5. Factory test reports.
 - 6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.
- C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.
- D. Startup Plans and Reports.
- E. Completed Prefunctional Checklists.
- F. Commissioning Issues Log:
 - 1. Construction observations.
 - 2. Supporting photographs.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- B. Responsibilities: Divisions 22,23 and 26 Contractors: Participate in the Commissioning process as a commissioning team member as described in this Section 01 91 13 and in the Commissioning Plan.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. The installing contractor will provide testing equipment and portable data loggers to be used to trend data for commissioning.
- B. All standard testing equipment required to perform startup and initial checkout and required Functional Testing, unless otherwise noted, will NOT become the property of Owner.

- C. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
 - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
 - 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
 - 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.
- E. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
 - 1. Dataloggers required for Functional Tests will be provided by the Commissioning Provider and will not become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

- A. Commissioning Provider will prepare the Commissioning Plan.
 - 1. Attend meetings called by the Commissioning Provider for purposes of completing the commissioning plan.
 - 2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
 - 1. Commissioning will be phased to minimize impact to the total construction time.
- D. Commissioning Schedule:
 - 1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Provider within 60 days after award of contract.
 - 2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
 - 3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
 - 4. Provide sufficient notice to Commissioning Provider for delivery of relevant Checklists and Functional Test procedures to avoid delay.

3.02 STARTUP PLANS AND REPORTS

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Provider.

3.03 PREFUNCTIONAL CHECKLISTS

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
 - 1. No sampling of identical or near-identical items is allowed.

2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
 3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
 - a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
 - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
 - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
 - d. Serial number of installed unit.
 - e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
 - f. Sensor and actuator calibration information.
 4. PECl (Samples) found at <http://www.peci.org/library/mcpgs.htm> indicate anticipated level of detail for Prefunctional Checklists.
- B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Provider is not required unless otherwise specified.
1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
 2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
 4. If any Checklist line item is not relevant, record reasons on the form.
 5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
 6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
 7. Submit completed Checklists to Commissioning Provider within 2 days of completion.
- C. Commissioning Provider is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
 2. Provide all additional information requested by Commissioning Provider to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
 3. Commissioning Provider may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
 4. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Provider Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
 2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

1. If difficulty in correction would delay progress, report deficiency to the Commissioning Provider immediately.

3.04 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.
- C. Commissioning Provider is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Provider will document the deficiency and the Contractor's stated intentions regarding correction.
 1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
 2. Use the standard form provided with copies submitted to Owner and Contractor.
 3. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Provider; the Commissioning Provider will reschedule the test, and the Contractor shall re-test.
 4. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
 5. Contractor shall bear the cost of Owner and Commissioning Provider personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.
- E. Functional Test Procedures:
 1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Provider with input by and coordination with Contractor.
 2. Examples of Functional Testing:
 - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
 - b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
 - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
 - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Provider is Functional Testing.
- F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

- G. Factory Tests: Commissioning Provider and Contractor are responsible for coordinating testing of equipment at the factory by factory personnel to ensure compliance with commissioning requirements.

3.05 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Architect beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate, and final results.
- C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
 2. Verify that sensors with shielded cable are grounded only at one end.
 3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
 4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
 2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
 2. Connect a signal generator in place of sensor.
 3. Connect ammeter in series between transmitter and building automation system control panel.
 4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
 5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
 6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
 7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
 8. Reconnect sensor.
 9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
 10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 11. If not, replace sensor and repeat.
 12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
 2. Pressure, Air, Water, Gas: 3 percent of design.
 3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
 4. Relative Humidity: 4 percent of design.

5. Barometric Pressure: 0.1 inch of Hg.
 6. Flow Rate, Air: 10 percent of design.
 7. Flow Rate, Water: 4 percent of design.
 8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 2. Set pump/fan to normal operating mode.
 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 4. Command valve/damper to open; verify position is full open and adjust output signal as required.
 5. Command valve/damper to a few intermediate positions.
 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
 2. Use an ultra-sonic flow meter to detect flow or leakage.

3.06 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
 2. Sampling is not allowed for:
 - a. Major equipment.
 - b. Life-safety-critical equipment.
 - c. Prefunctional Checklist execution.
 3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
 4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
 5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
 6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
 7. If YY percent of the units in the second sample fail, test all remaining identical units.
 8. If frequent failures occur, the Commissioning Provider may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

- D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
 - 1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Provider's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
 - 2. Other points will be monitored by the Commissioning Provider using dataloggers.
 - 3. At the option of the Commissioning Provider, some control system monitoring may be replaced with datalogger monitoring.
 - 4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
 - 5. Graphical output is desirable and is required for all output if the system can produce it.
 - 6. Monitoring may be used to augment manual testing.

3.07 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 78 00 - Closeout Submittals for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Provider for review; make changes recommended by Commissioning Provider.
- D. Commissioning Provider will add commissioning records to manuals after submission to Owner.

END OF SECTION

**SECTION 02 41 00
DEMOLITION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building demolition excluding removal of hazardous materials and toxic substances.
- B. Selective demolition of built site elements.

1.02 RELATED REQUIREMENTS

- A. Section 01 57 13 - Temporary Erosion and Sediment Control.
- B. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- C. Section 02 41 13 - Selective Demolition.
- D. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; earth stripping and stockpiling.
- E. Section 31 20 00 - Earth Moving: Excavating trenches for utilities. Filling and subgrade preparation.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices.
 - 3. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Summary of safety procedures.
 - 3. Demolition firm qualifications.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of five (5) years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

- A. Remove the entire building designated Police Station and Library.
- B. Remove only the paving and curbs required to accomplish new work.
- C. Remove foundation walls and footings to minimum 2 feet below finished grade.

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
Demolition
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- D. Remove underground tanks.
- E. Remove manholes and manhole covers, curb inlets and catch basins.
- F. Remove fences and gates.
- G. Remove creosote-treated woods.
- H. Remove other items indicated, for salvage and relocation per Section 02 41 13 Selective Demolition.
- I. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 20 00 - Earth Moving..

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
- E. Minimize production of dust due to demolition operations. Do not use water if that will result in flooding, sedimentation of public waterways or storm sewers, or other pollution.
- F. Hazardous Materials:
 - 1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
 - 2. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
- G. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 - 2. Dismantle existing construction and separate materials.
 - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

- H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

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

3.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove materials not to be reused on site per Section 01 74 19 - Construction Waste Management and Disposal.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands on a daily basis.

END OF SECTION

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**SECTION 02 41 13
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.

1.02 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, antiques, and similar objects including, but not limited to cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.03 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.

1.04 SUBMITTALS

- A. Engineering Survey: Submit engineering survey of condition of building.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of selective demolition activities with starting and ending dates for each activity.
- D. Pre-demolition photographs or video.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.
- F. Inventory of items that have been removed and salvaged.

1.05 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.06 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.
- F. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.07 WARRANTY

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

PART 2 - PRODUCTS

Issued for Construction

Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026

SELECTIVE DEMOLITION

02 41 13 -1

2.01 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- C. Inventory and record the condition of items to be removed and salvaged.

3.02 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.03 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain for on-going operations and protect them against damage. See Phasing Plan.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of neighboring site

3.04 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.05 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

4. Maintain fire watch during and after flame-cutting operations.
 5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 6. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 52 00 "Construction Waste Management".
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.06 CLEANING

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 - "Construction Waste Management and Disposal".
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

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**SECTION 02 82 00
ASBESTOS REMEDIATION**

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. 29 CFR 1926.1101 - Asbestos; Current Edition.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

1.02 SUMMARY

- A. Work Included - General
 - 1. Provide all labor, material, equipment, services, testing, employee training, fit test, medical exams, transportation, and daily expense to meet the requirements of this Specification.
 - 2. Contractor shall obtain all required permits, licenses, registrations, notifications, and regulatory approvals required by law (federal, state and local) and this specification.
 - 3. All asbestos remediation activities associated with this Contract shall be performed during the work period specified in this Contract.
 - 4. Contractor shall guard against unnecessary disturbances or damage to sensitive finishes on buildings, building systems, and equipment, if required.
- B. Work Included – Specific
 - 1. Contractor is responsible for identifying the exact locations, number of work areas, verify all quantities in the field, and should also refer to Demolition Floor Plan Drawings for Hazmat Scope of Work. Demolition Drawings are diagrammatic in nature. Contractor shall coordinate hazmat scope of work with Demolition Floor Plan Drawings and shall be responsible for all asbestos removal and management necessary to perform required scope of work.
 - 2. Submit for Client (City of Newport Beach) approval an Asbestos Work Plan and Schedule outlining necessary asbestos removal and management work. Said Work Plan shall include work practices and procedures to be utilized, and the corresponding Schedule must identify start and completion dates, and milestones, such as containment and clearance inspections, clearance testing and demobilization, where applicable. Contractor shall execute the Work Plan safely and efficiently and maintain compliance with this section's requirements.
 - 3. This project is an abatement/removal.
 - 4. Refer to Table 1 below for material to be removed:

TABLE 1 - ASBESTOS REMEDIATION

BUILDING	ROOM NO. OR AREA DESCRIPTION	BUILDING SYSTEM TYPES
LIBRARY	FLOOR (THROUGHOUT), BATHROOMS A, B & STAFF BATHROOM	9”X9” BEIGE/12”X12” GREY VINYL FLOOR TILE & BLACK MASTIC
LIBRARY	NON-FICTION NORTH	GREEN VINYL FLOORING & BLACK MASTIC (UNDER BOOKSHELVES)
LIBRARY & FIRE DEPARTMENT	FLOOR (THROUGHOUT)	BLACK FLOOR MASTIC
FIRE DEPARTMENT	1ST FLOOR ENTRY ROOM, 2ND FLOOR OFFICE & LIVING ROOM	9”X9” TAN SPECK/9”X9” BEIGE VINYL FLOOR TILE & BLACK MASTIC
EXTERIOR	ROOF ABOVE LIBRARY & FIRE DEPARTMENT	LAYERED ROOFING MATERIAL

EXTERIOR	ROOF ABOVE LIBRARY & FIRE DEPARTMENT	BLACK ROOF PENETRATION MASTIC
EXTERIOR	ROOF ABOVE LIBRARY	CONCRETE ROOFING TILES & FELT/ ROOFING TILE MASTIC
LIBRARY	ATTIC	TRANSITE PIPE
EXTERIOR	UNDERGROUND WATERLINE AT NW, NORTH & NE PERIMETER	ACP (ASBESTOS CEMENT PIPE)

1.01 SITE CHARACTERIZATION

NOTE: BE SURE THAT CONTRACTS RECEIVES THE BUILDING SURVEY REPORT IN THE BELOW PARAGRAPH FROM THE PROJECT MANAGER TO INCLUDE IN THE INFORMATION AVAILABLE TO BIDDERS

- A. Project site surveillance was conducted by Advanced Environmental Group, Inc's Division of Occupational Safety and Health (DOSH) Certified Asbestos Consultant (CAC) and Certified Site Surveillance Technician (CSST). Materials found or presumed to contain asbestos at this project site are listed in the table below. Note: Table 2 is a list of asbestos containing materials sampled at various locations throughout the project. For the complete scope of work, Contractor shall refer to the Hazardous Materials Survey Report, and the Demolition Floor Plan drawing for the approximate locations of the materials requiring abatement/removal. Refer to the Hazardous Materials Survey Report, included in the Information Available to Bidders.
1. The results shown in the "Percent Asbestos" column were obtained using standard PLM testing. Any result shown as <1 percent or "trace" shall be analyzed by point count methodology. DOSH defines Asbestos Containing Construction Material (ACCM) as any material containing > 0.1% Asbestos. Any removal of 100 sq feet or more of ACCM requires notification of the nearest DOSH district office, 24-hour prior to work.
 2. Refer to Table 2 below for asbestos samples:

TABLE 2 - ASBESTOS CONTAINING MATERIALS

BUILDING	ROOM NO. OR AREA DESCRIPTION	BUILDING SYSTEM TYPES	ASBESTOS TYPE	PERCENT ASBESTOS	APPROXIMATE QUANTITY*
LIBRARY	FLOOR (THROUGHOUT), BATHROOMS A, B & STAFF BATHROOM	9"X9" BEIGE/12"X12" GREY VINYL FLOOR TILE & BLACK MASTIC	CHRYSTILE	TRACE-3%	5400 FT2
LIBRARY	NON-FICTION NORTH	GREEN VINYL FLOORING & BLACK MASTIC (UNDER BOOKSHELVES)	CHRYSTILE	2%	800 FT2
LIBRARY & FIRE DEPARTMENT	FLOOR (THROUGHOUT)	BLACK FLOOR MASTIC	CHRYSTILE	3%	8700 FT2
FIRE DEPARTMENT	1ST FLOOR ENTRY ROOM, 2ND FLOOR OFFICE & LIVING ROOM	9"X9" TAN SPECK/9"X9" BEIGE VINYL FLOOR TILE & BLACK MASTIC	CHRYSTILE	TRACE-3%	640 FT2

TABLE 2 - ASBESTOS CONTAINING MATERIALS

BUILDING	ROOM NO. OR AREA DESCRIPTION	BUILDING SYSTEM TYPES	ASBESTOS TYPE	PERCENT ASBESTOS	APPROXIMATE QUANTITY*
EXTERIOR	ROOF ABOVE LIBRARY & FIRE DEPARTMENT	LAYERED ROOFING MATERIAL	CHRYSTILE	85%	6000 FT2
EXTERIOR	ROOF ABOVE LIBRARY & FIRE DEPARTMENT	BLACK ROOF PENETRATION MASTIC	CHRYSTILE	2-5%	30 FT2
EXTERIOR	ROOF ABOVE LIBRARY	CONCRETE ROOFING TILES & FELT/ ROOFING TILE MASTIC	CHRYSTILE	TRACE-3%	3000 FT2
LIBRARY	ATTIC	TRANSITE PIPE	CHRYSTILE	PACM	15 LF
EXTERIOR	UNDERGROUND WATERLINE AT NW, NORTH & NE PERIMETER	ACP (ASBESTOS CEMENT PIPE)	CHRYSTILE	PACM	316 LF

*CONTRACTOR TO VERIFY ALL QUANTITIES IN THE FIELD

- B. Hazardous materials, other than asbestos containing material (ACM)/Presumed asbestos containing material (PACM) that have the potential to be disturbed at this project site are listed in Table 3 below:

TABLE 3 - OTHER HAZARDOUS MATERIALS AT PROJECT SITE

BUILDING / AREA / SYSTEM TYPE	MATERIAL DESCRIPTION	TYPE OF HAZARD	RESULTS (MG/KG)	APPROXIMATE QUANTITY*
EXTERIOR / ROOF / ROOF VENT & FLASHINGS	RED PAINT	LEAD	87100	100 FT2
LIBRARY / NON-FICTION NORTH / CEILING BEAMS & CEILING	OFF-WHITE PAINT	LEAD	16700	860 FT2
FIRE DEPARTMENT / 1ST FLOOR / BATHROOM & LAUNDRY / WALLS	WHITE, GREY & TAN PAINT	LEAD	1320	350 FT2
LIBRARY / NON-FICTION NORTH / WALLS	CREAM PAINT	LEAD	1160	1120 FT2

LIBRARY / BATHROOM A & B / WALLS	OFF-WHITE & OLIVE PAINT	LEAD	1040	640 FT2
*CONTRACTOR TO VERIFY ALL QUANTITIES IN THE FIELD				

- C. Tables 1, 2 and 3 identify Hazardous Materials located within the project area. Contractor shall presume Hazardous Materials listed in Tables 1, 2 and 3 are prevalent throughout the building. Contractor shall exercise care to ensure Hazardous Materials present inside and outside the project area are not damaged or disturbed, without the use of appropriate engineering controls, work practices, and personal protective equipment. See EXHIBIT 3 ASBESTOS/LEAD/HAZARDOUS MATERIAL SURVEY, includes survey report.
- D. Prior to handling other hazardous materials at the project site, Contractor shall coordinate with the Client's Representative to review City protocols with a qualified Environmental Health and Safety's Representative.

1.02 JOB WALK PROTOCOL

1.03 THE PRE-BID JOB WALK SHALL INCLUDE THE INSPECTION OF ASBESTOS WORK AREAS CITED IN PARAGRAPH ABOVE.

1.04 ABBREVIATIONS AND DEFINITIONS

A. Abbreviations

ACM	Asbestos Containing Material
ACBM	Asbestos Containing Building Material
ACCM	Asbestos Containing Construction Material
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
CAC	Certified Asbestos Consultant
CARB	California Air Resources Board
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CIWWB	California Integrated Waste Management Board
CSLB	Contractor's State Licensing Board
CSST	Certified Site Surveillance Technician
DOSH	Division of Occupational Safety and Health
DOT	Department of Transportation
DTSC	California Department of Toxic Substances
EAP	Emergency Action Plan
EH&S	Environmental Health and Safety
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
FVC	Forced Vital Capacity
FEV1	Forced Expiratory Volume at 1 second
HEPA	High Efficiency Particulate Absolute
HVAC	Heating, Ventilation, and Air Conditioning
GFCI	Ground Fault Circuit Interrupter
NEA	Negative Exposure Assessment

NESHAPS	National Emissions Standard for Hazardous Air Pollutants
NFPA	Nation Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPE	Negative Pressure Enclosure
NVLAP	National Voluntary Laboratory Accreditation Program
O&M	Operations and Maintenance Training
OSHA	Occupational Safety and Health Administration
PACM	Presumed Asbestos Containing Material
PCM	Phase Contrast Microscopy
PEL	Permissible Exposure Limit
PLM	Polarized Light Microscopy
PPE	Personal Protection Equipment
RACM	Regulated Asbestos Containing Material
SCAQMD	South Coast Air Quality Management District
SDS	Safety Data Sheets
SMR	Single Ply Membrane Roof
SSN	Social Security Number
SWQCB	State Water Quality Control Board
TEM	Transmission Electron Microscopy
TPM	Third-Party Monitor
TSI	Thermal System Insulation
UFC	Uniform Fire Code
UL	Underwriters Laboratories

1.05 DEFINITIONS: THE FOLLOWING DEFINITIONS ARE PROVIDED FOR ADDITIONAL CLARIFICATION AND MAY EXCEED FEDERAL, STATE, OR LOCAL REGULATORY REQUIREMENTS.

- A. ABATEMENT: Removal, enclosure, encapsulation, etc., of asbestos.
- B. ABATEMENT/REMOVAL: As used here it refers to activities where removal is the abatement method chosen.
- C. INTERIM CONTROL: Encapsulation, enclosure, and repair of ACM or ACBM and may include a maintenance program.
- D. For the purpose of worker protection and waste disposal, ACBM is defined as 1 tenth of 1 percent by weight (0.1 percent); ACM is defined as greater than 1 percent by weight (1.0 percent). The definitions of friable vs. non-friable ACM follow SCAQMD Rule 1403. or the appropriate EPA delegated Air District/CARB.
- E. Ambient Air Quality is established with a PCM or TEM baseline sample prior to the commencement of asbestos-related work.
- F. Class I Asbestos work involves the remediation of TSI and/or surfacing material when:
 - 1. More than 1 glove bag is used;
 - 2. More than one 60 inch by 60 inch waste bag is used; or,
 - 3. The work is not repair or maintenance as defined by Class III.
- G. Class II Asbestos work involves the remediation of non-TSI or non-surfacing when:
 - 1. More than 1 glove bag is used;
 - 2. More than one 60 inch by 60 inch waste bag is used; or,
 - 3. The work is not repair or maintenance as defined by Class III.

- H. Class III Asbestos work involves repair and maintenance of ACM/PACM that is either Class I or Class II materials but does not exceed either 1 glove bag or one 60-inch disposal bag (1 cubic meter).
- I. Class IV Asbestos work refers to clean-up operations of Class I, II, or III projects. Class IV Asbestos work does not refer to incidental contact by maintenance workers (see Title 8 CCR 5208 for custodial/maintenance worker's guidelines).
- J. NPE refers to full containment, mini-containments, and glove bags under negative pressure with HEPA filtration. NPE includes smoke testing each shift, manometer testing to prove -0.02 inches negative pressure differential, electrical circuits off unless a GFCI is used, air movement is away from workers toward HEPA unit and air movement that provides one air change every 5 to 15 minutes. Glovebags must also be smoke tested. No sliding or reuse of the glove bag is permitted, adjacent material must be sealed, and a minimum of 2 workers are required to perform glove bag operations.
- K. Competent Person: DOSH certified Supervisor with the authority to take prompt corrective measures to eliminate unsafe, unsanitary, hazardous, dangerous, or unacceptable environmental conditions.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01 30 00 – Administrative Requirements, specifying submittal procedures. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review: Shop Drawings, Product Data and Samples, and Closeout Procedures.
- B. Submit proposed material substitutions complying with requirements in Contract Documents.
- C. References: Submit names, addresses and telephone numbers of at least 3 project managers or owners (not employed by Contractor) for whom Contractor has performed asbestos remediation jobs of similar size and character to the work specified in this Contract.
- D. General: Submittal requirements listed below shall be approved by the Client's Third-Party Monitor and approved by the Client's Representative prior to scheduling the start of project Site Work. Submit the number of copies Contractor requires, plus 2 copies that will be retained by the City of Newport Beach. Work shall not begin until such approval has been given, a preconstruction meeting has been conducted, and a bound copy of project submittal is placed at an easily accessible location at the project site.
 - 1. Notifications and Permits: Submit copies of all regulatory agency notifications and permits.
 - 2. Worker Training, Respiratory Fit Test, and Medical Certificates. Do not submit any documents that contain or show Employee full SSN. If original documents do show the SSN, then remove or redact all but the last 4 digits before submitting copies.
 - 3. Training Certificates: For each employee who will be employed on the project, submit a copy of each employee's DOSH asbestos training certification.
 - 4. Qualifications of person taking Personal Air Samples: Submit the qualifications of the person who will be responsible for collecting personal air samples (PCM) of Contractor's employees (DOSH Supervisor certification required).
 - 5. Respiratory Fit Test: For each Asbestos Worker employed on the project, submit a copy of a fit test successfully passed within the previous 12 months.
 - 6. Physician's Certification of Medical Fitness: Submit evidence of each asbestos-trained worker successfully passing a medical examination within the previous 12 months. The medical exam shall conform to the standards cited in Title 8 CCR, Section 1529, Appendices D and E.
 - 7. Respiratory Protection Program: Submit a copy of Contractor's written respiratory protection program.
 - 8. Medical Surveillance Program: Submit a copy of Contractor's written medical surveillance program.
 - 9. Emergency Action Plan: Submit a copy of Contractor's written EAP.

10. Safety Programs: On company letterhead, submit confirmation that Contractor has written safety programs for Injury Illness Prevention (mandatory for all projects), Hazard Communication (mandatory for all projects), Fall Protection (when applicable), Lock Out Tag Out (when applicable), and Confined Space (when applicable).
11. Work Plan and Schedule: Submit proposed work plan and schedule for accomplishing asbestos remediation activities. The work plan shall be project specific and address project site preparation, site and engineering controls, worker protection and exposure monitoring, and protection of building occupants from exposure to ACM at or above the permissible exposure limit. Work will not commence until Plan is reviewed and approved by the Client's Representative and Third-Party Monitor.
12. Product Data and Safety Data Sheets (SDS): Submit copies of the manufacturers' safety data sheets, for all products proposed for use on the project. Copies shall be the latest available from the manufacturer.
13. Laboratory Qualifications: Contractor shall submit evidence of certification and accreditation by the National Voluntary Laboratory Accreditation Program (NVLAP) and American Industrial Hygiene Association (AIHA) for any laboratory performing PCM, PLM, or TEM sample analysis.
14. HEPA Equipment Inspection: Contractor to visually inspect all HEPA equipment to ensure all components are in good working condition, HEPA filter is free of rips, tears, and/or damage, HEPA filter is properly seated in equipment. All equipment to be documented and copy of documentation given to the Client's Representative and Third-Party Monitor prior to starting project site work.
15. Emergency Contact List: Submit an emergency contact list; include name, phone number, fax number and direct connect number if using direct connect equipment for Contractor's supervisor or competent person who can be reached on a 24-hour basis.
16. Submit a Hazardous Waste Disposal Plan that includes estimated number of container(s), size of containers(s), hazardous material transporter name and disposal site using the Asbestos Waste Disposal Plan Form located at the end of this section, before start of work on project. The Client's Representative will forward a copy to the Hazardous Waste Manifest Representative.
17. Asbestos Close-out Package: Submit Asbestos close-out package, further described in section 3.15, within 14 calendar days of the last day of field work. Include copy of Respirator Fit test, Medical Report, required Training Certificate of all who entered the containment and a copy of the sign in-out sheets.

1.07 CONTRACTOR QUALIFICATIONS

- A. Contractor performing asbestos remediation work must be currently licensed by California Contractor State License Board with an Asbestos Certification.
- B. Contractor performing asbestos remediation work must be currently registered with the California Department of Industrial Relations, Division of Occupational Safety and Health, Asbestos Contractor Registration Unit.
- C. Contractor's personnel performing Class I, II, III, or IV Asbestos Work shall meet the following training requirements, which exceed the standards in Title 8 CCR, Section 1529:
 1. Class I:
 - a. Supervisors and Workers – DOSH certified, supervisor 40-hour course and worker 32-hour course, administered by a DOSH accredited training provider.
 2. Class II:
 - a. Supervisors and Workers – DOSH certified, supervisor 40-hour course and worker 32-hour course, administered by a DOSH accredited training provider. Alternate DOSH certification in specific abatement activities may be permitted (i.e., roofing, flooring, etc.).
 3. Class III:
 - a. Supervisors and Workers must be DOSH certified, supervisor 40-hour course and worker 32-hour course, administered by a DOSH accredited training provider.

4. Class IV:
 - a. Supervisor must be DOSH trained (40 hours, administered by a DOSH accredited training provider).
 - b. Workers entering a contaminated space, handling waste bags, vacuuming miscellaneous debris in an active abatement area must have the same level of training as the abatement workers.
 - c. Workers who incidentally touch, but do not disturb the asbestos matrix are required to have 16 hours of asbestos Operations and Maintenance Training (O&M) provided by a DOSH training provider.

1.08 RULES, REGULATIONS AND INDUSTRY CONSENSUS STANDARDS

- A. Contractor shall comply with the most recent edition of applicable federal, state, local, and city standards specified herein, laws, codes, and regulations. City standards may exceed other requirements.
- B. The list of regulators and regulations, cited below, serves as a reference for the most commonly used standards governing the asbestos industry, including but limited to the following:
 1. Federal Regulators and Regulations
 - a. EPA - Environmental Protection Agency
 - 1) 40 CFR, Part 763, Subpart E – AHERA
 - b. OSHA - Occupational Safety and Health Administration
 - 1) 29 CFR 1926.1101 - Construction Standard
 - 2) 29 CFR 1910.1001 - General Industry Standard
 - 3) 29 CFR 1910.147 - Lock Out - Tag Out
 - c. NESHAPS - National Emission Standards for Hazards Air Pollutants
 - 1) 40 CFR 61, Subpart M - Asbestos Emissions
 - 2) 40 CFR 61, Subpart A
 - d. DOT - Department of Transportation
 - 1) 49 CFR 170-172
 - e. NFPA - National Fire Protection Association
 - 1) NFPA 701
 - f. UFC – Uniform Fire Code
 - 1) Standard 10-1 – Portable Fire Extinguishers
 - 2) UFC 8704.4.2 – Fire Safety During Construction
 - g. UL – Underwriters Laboratories
 - 1) 586 – High Efficiency Particulate Air Filter
 2. State Regulators and Regulations
 - a. Cal/OSHA - California Department of Occupational Safety and Health
 - 1) Title 8 CCR Section 1529 - Construction Asbestos Standard
 - 2) Title 8 CCR Section 3203 - Injury and Illness Prevention
 - 3) Title 8 CCR Section 5144 – Respiratory Protection
 - 4) Title 8 CCR Section 5157 - Confined Space
 - 5) Title 8 CCR Section 5194 - Hazard Communication
 - 6) Title 8 CCR Section 5208 - General Industry Asbestos Standard
 - b. DTSC - Department of Toxic Substance Control
 - 1) Title 22 CCR Sections 66261.24, 66268.7, 66268.114
 - c. CIWMB - California Integrated Waste Management Board
 - d. SWQCB - State Water Quality Control Board CCR, Title 23
 - e. CSLB - California State Licensing Board
 - 1) Business and Professional Code Section 7058.5
 3. Local Regulators and Regulations
 - a. SCAQMD – South Coast Air Quality Management District
 - 1) Rule 1403. Asbestos Emissions From Demolition/Renovation Activities
 - b. CARB Rules and Regulations

4. Industry Consensus Standards
 - a. ANSI – American National Standards Institute
 - 1) Z9.2 – Fundamentals Governing the Design and Operation of Local Exhaust Systems
 - 2) Z88.2 – Practices for Respiratory Protection
 - b. ASTM - American Society for Testing Materials
 - 1) E849 – Safety and Health Requirements Relating to Occupational Exposure to Asbestos
 - 2) E1368 – Standard Practice for Visual Inspection of Asbestos Abatement Projects
 - 3) P-189 – Specification for Encapsulants for Friable Asbestos Containing Building Materials

1.09 NOTIFICATION AND PERMITS

- A. Contractor is responsible for notifying federal, state and local agencies, obtaining all required permits or extensions, and paying all related fees.
- B. South Coast Air Quality Management District
 1. Provide 10-day notification to SCAQMD for any demolition or renovation job with RACM that exceeds a combined amount of 100 sq feet.
- C. NESHAPS
 1. Contractor does not need to notify NESHAPS separately from the SCAQMD, if they provide the required additional NESHAPS information on the SCAQMD form.
- D. CAL/OSHA (DOSH)
 1. Provide 24-hour notification to nearest DOSH district office prior to commencement of work exceeding 100 sq feet. Only DOSH registered Contractors are permitted to perform Class I and II work at the site.

1.10 CITY CONTACTS

- A. City Engineer Representative: Tom Sandefur, P.E.
 1. Office: (949) 644-3321
 2. Cell: (310) 383-4790
- B. City of Newport Beach - Hazardous Waste Manifest Representative: Tom Sandefur, P.E.
 - a. Office: (949) 644-3321
 - b. Cell: (310) 383-4790
 - c. E-Mail for City of Newport Beach Hazardous Waste Manifest Representative: tsandefur@newportbeachca.gov
- C. TPM/CAC/EH&S: Herb Henggeler
 - a. Office: (949) 361-7797
 - b. Cell: (949) 324-6797
 - c. Email: hhenggeler@aegconsultants.com
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PART 2 - PRODUCTS

2.01 MATERIALS

- A. Surfactants

1. Foster 32-90 or equal for amended water applications. H.B. Fuller Co., Foster Products Corporation, Vadnais Heights, MN manufactures the Foster product.
- B. Encapsulants
 1. The following products shall be applied using a brush or an airless sprayer. Contractor shall follow strict manufacturer's instructions regarding surface preparation, ambient air conditions, depth of material penetration, recommended thickness of a dry application, and curing time.
 - a. For penetrating and lockdown purposes use Foster 32-60 or equal.
 - b. For bridging purposes use Foster 32-32 or equal.
 - c. For high temperature applications, e.g., steam pipes, use Foster 84-18, or equal.
 2. Refer to Substitution Procedures. Any proposed equal to the products listed above must meet the following criteria: non-toxic and non-irritating as defined by the Hazardous Substance Control Act; and, sufficiently tinted to provide contrast with the material being coated. Submit product information to Client's Representative to request approval by Client's Third-Party Monitor representative.
 3. All products shall be rated UL Class A and have a flame resistance or spread rate less than or equal to 25 as designated by the ASTM code E 162.
- C. Polyethylene Bags and Sheeting
 1. Poly sheeting used for asbestos containments are required to be:
 - a. Six mil thick;
 - b. Meet or exceed the following standards - ASTM E84, with a flame resistance or spread rate less than or equal to 25 ASTM (E-162).
 2. Poly-America or equal.
 3. The polyethylene sheeting used for containment or critical barriers shall be fire rated. Polyethylene bags or sheeting used for waste shall be clear.
- D. Adhesive Removers
 1. All adhesive removers shall meet the Hazardous Substance Control Act standards for non-toxic and non-irritating properties.
 2. All adhesive removers shall be:
 - a. Non-flammable
 - b. Contain less than 1 Percent (by volume) any chlorinated hydrocarbon solvents.

2.02 EQUIPMENT

- A. HEPA filtered equipment, such as vacuums and negative air machines, must be inspected by contractor to ensure all components are in good working condition, HEPA filter is free of rips, tears, and/or damage, HEPA filter is properly seated in equipment. All equipment to be documented and copy of documentation given to the Client's Representative and Third-Party Monitor prior to starting project site work.
- B. Tools and equipment shall arrive at the project site free of asbestos debris and dust.
- C. HEPA equipment must be clean when arriving on project site. All openings on the equipment must be taped shut until ready for operation.
- D. All electric tools and equipment shall be connected to a GFCI.

PART 3 - EXECUTION

3.01 3.1 SAFETY

- A. In accordance with state, local and federal laws, Contractor shall be solely responsible for conditions of the project site; including the safety of all persons and property during the performance of work. To ensure effective communication in safety matters Contractor shall participate in and conduct the following meetings:
 1. City mandated pre-construction safety meetings include Client's Representative and Third-Party Monitor. The following subjects shall be discussed: Special Construction

Specifications; impact to building occupants; waste disposal and work-related safety programs.

2. On the first day of asbestos field work, Contractor shall conduct a safety meeting (tailgate) for its employees which alerts them to the specific hazards of the project. Contractor must conduct the safety meeting in the primary languages of its employees. If needed, more than 1 primary language presentation must occur. If non-English speaking workers are used, there must be a bi-lingual worker or supervisor within line-of-sight to facilitate clear communications.
3. On a weekly basis, Contractor shall conduct a safety meeting with its employees.

3.02 WORK SITE PREPARATION

- A. Prior to beginning any on-site work preparation, Contractor shall walk the project area with the Client's Representative and Third-Party Monitor to discuss site characterization, regulated area set-up, access controls, background samples, security, and safety issues.
- B. Post all regulatory notices, permits, sign in-out roster and air sample results at the primary entrance to the project site.
- C. Contractor, in coordination with the Third-Party Monitor, shall ensure all electrical and HVAC equipment servicing the work area is isolated and locked out. Electrical tools in the work zone must be connected to a GFCI.
- D. Contractor shall remove existing filters from the HVAC systems serving the work area. Existing HVAC openings, windows, vents, open pipes, skylights, ducts, doorways, corridors, and diffusers shall be sealed with double layers of plastic (6-mil) and cardboard or plywood inserts as necessary.
- E. Contractor shall pre-clean. The area to be pre-cleaned will be a minimum of 10 feet outside the NPE or surrounding structure whichever is closest and sufficient to attain clearance sampling results of either <0.01 f/cc or 70 structures per mm² by TEM (<0.01 f/cc by PCM alternate when approved). Contractor shall pre-clean exposed fixed objects, grates, and interior surfaces within the containment.
- F. Contractor shall install approved backflow prevention devices before connecting to the Client's domestic water system. Contact the Client's Representative for a list of approved devices.
- G. Contractor is obligated to coordinate inspection schedules with the Third-Party Monitor.
- H. All Class I, II, III, and IV work shall be conducted within a regulated area per Title 8 CCR Section 1529.
- I. When requested by the Client's Representative and Third-Party Monitor, Contractor shall establish project site control barriers.

3.03 WORK SITE CONTROL

- A. Contractor shall restrict the work areas to authorized personnel; including, Contractor's employees, Client's Representative, Third-Party Monitor, and regulatory agency representatives.
- B. At regulated project sites, Contractor shall use caution tape to demarcate the boundary of the work zone, and post warning signs.
 1. The required signage by Title 8 CCR 1529 should read:

**DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES CANCER TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS AREA**

- A. All unauthorized personnel are to remain outside the regulated area. Contractor shall call the Client's Representative and Third-Party Monitor about problem situations.
- B. If inclement weather threatens any portion of the project site (interior, exterior or roof), Contractor shall take all necessary measures to ensure asbestos-contaminated debris does not migrate from regulated areas.
- C. If wind speed threatens any portion of the project site (interior, exterior or roof), Contractor shall erect a wind barrier or suspend operations until the wind is below 15 mph.

9.02 RECORDKEEPING

- A. Contractor shall maintain the following records at the regulated work area and copies are to be provided in the "As-Built" summary at the end of the job:
 - 1. Site Log (sign-in and sign-out).
 - 2. Incident Log and Emergency Action Plan.
 - 3. Personal air sampling results.
 - 4. Area sample results from inside and outside the regulated area.
 - 5. Supervisor (Contractor) and Worker DOSH training certificates, fit tests, and medical clearance certificates.
 - 6. Safety Data Sheets for the products in use or proposed for use.
 - 7. SCAQMD notification.
- B. The Third-Party Monitor will retain all records of wipe, bulk, initial, area (perimeter), and clearance samples. Results are reported on a daily basis, via e-mail, to the Client's Representative. At the end of the project, all sampling records are reviewed by Third-Party Monitor and submitted as a complete package in the project close out.

9.03 ADMINISTRATIVE CONTROLS

- A. Remediation projects performed in high heat environments require Contractor to provide sufficient breaks to maintain a safe environment for their workers.
- B. Administrative controls are not acceptable to manage workers exposure to Asbestos.

9.04 ENGINEERING CONTROLS

- A. Negative Pressure Enclosure (NPE)
 - 1. A negative pressure enclosure is required when ACM or PACM is friable or could become friable during the removal process. After approval by the Client's Representative and Third-Party Monitor, non-friable material that remains non-friable during the removal process does not require a negative pressure enclosure.
 - 2. There are 3 possible negative pressure enclosures systems for the project: full containment; mini containment, and glove bag.
 - 3. Full containment requires Contractor to comply with all provisions in Title 8 CCR 1529 and SCAQMD Rule 1403. The following items are provided as a reminder of key elements and are not meant to be comprehensive: walls—2 layers of 6 mil polyethylene sheeting, floors – 2 layers 6-mil polyethylene sheeting, and ceilings—2 layers of 6 mil polyethylene sheeting; 3 stage decontamination unit with shower; sufficient negative pressure to maintain -0.02 inches of water column pressure; one air change every 5 to 15 minutes; viewing port; NPE is smoke tested; manometer alarm, and emergency response protocols.
 - 4. The containment for the removal of floor tile, mastic and cove base mastic requires the following items that are provided to be a reminder of key elements and are not meant to be comprehensive: walls-1 layers of 6 mil polyethylene sheeting shall be attached three (3') up from the top of the cove base and utilized as a splash guard for the removal of the cove base mastic, floor tile and floor tile mastic (3D scrape and/or chemical strip); 3 stage decontamination unit with shower; sufficient negative pressure to maintain -0.02 inches of water column pressure; one air change every 5 to 15 minutes; viewing port; NPE is smoke tested; manometer alarm, and emergency response protocols.
 - 5. Mini-containments: The construction of a mini-containment requires 2 layers of 6-mil polyethylene minimum of 1 chamber, a HEPA vacuum exhausting the chamber, the

chamber shall be affixed to the area to be abated and smoke tested. Comply with all mini-containment requirements as stated in Title 8 CCR 1529. Single chamber containments may be used to access positive pressure environments for Class III Asbestos work.

6. Glove bag jobs shall comply with the provisions in Title 8 CCR 1529. The type of glove bag must correspond to the type of activity; e.g., angle glove bags for curved pipe sections, vertical glove bags for vertical pipe, etc. Glove bags must be smoke tested and a HEPA vacuum device shall be attached.

B. HEPA Equipment

1. Contractor shall ensure all HEPA filtration units are inspected on project site.
2. Contractor shall HEPA vacuum visible debris prior to set-up, during the removal process and at the conclusion of each shift.
3. HEPA equipment used to establish negative air pressure within a space must run the exhaust outside the building and remain on 24 hours a day until the project is complete.
4. Contractor shall ensure make-up air is drawn through an inlet that can be easily sealed in the event of a negative air failure. The inlet sealing method must also be effective when there is a failure in the system after normal working hours.
5. All HEPA filters must be disposed of as asbestos waste.

C. Wet Methods

1. Prior to removing ACM/PACM, Contractor shall adequately wet the material with an approved surfactant using an approved method. Refer to SCAQMD Rule 1403 and the EPA publication Asbestos/NESHAPS Adequately Wet Guidance for proper techniques. During and after removal, the waste must remain adequately wet.

D. Removal Operations

1. Contractor must have its Competent Person on-site during the removal of any RACM per SCAQMD Rule 1403.
2. During gross removal operations, keep the waste wet, continually bag the waste, and ensure all accumulated debris is completely sealed by the end of the shift. After gross debris is bagged, use wet wipe methods and HEPA vacuums to clean the polyethylene sheeting.

9.05 WORKER PROTECTION

A. The following protective measures are required for asbestos-related work associated with this project:

1. Employee Training and Supervision
 - a. Contractor shall provide information to its employees about asbestos and other hazards per the Hazard Communication standard (Title 8 CCR 5194).
 - b. An accredited DOSH course provider must train asbestos workers and supervisors.
2. Respiratory Protection
 - a. Contractor shall provide respiratory protection to all employees where there is the potential for exposure to asbestos dust at or above the permissible exposure limit. Respiratory protection shall be provided at no cost to Contractor's employees.
 - b. Contractor's employees who wear a respirator must have passed a fit test within the previous 12 months (Title 8 CCR 1529) to perform contract work.
 - c. Workers utilizing respirators shall have removed any facial hair that impedes the seal of the respirator facepiece to the face. Goatees and beards are prohibited.
3. Protective Clothing
 - a. Contractor shall provide workers and authorized visitors with sufficient sets of protective clothing whenever there is potential exposure to asbestos dust or disturbance of ACM/PACM. Tyvex, Kleenguard coveralls or equal with attached hood and feet are acceptable. Contractor shall provide coveralls to Contractor's employees, Client's Representative and staff, State, and local officials at no additional cost to the City.

- b. Contractor shall provide rubber, nitrile or latex gloves, rubber boots, eye protection, earplugs and hard hats as needed per the Title 8 CCR 5194 Hazard Communication and Personal Protection Equipment standards.
- 4. Medical Surveillance
 - a. As required by 8 CCR 1529, Contractor shall establish a medical surveillance program for all employees performing Asbestos work.
 - b. Contractor shall provide copies of the physician's written opinion for each employee who works on the project site (8 CCR 1529).
 - c. All Contractor's Asbestos workers and supervisors must pass the medical, FVC, FEV1 and chest x-ray examinations prior to working on the project.

9.06 PERSONAL HYGIENE

- A. Contractor shall require that no employee be allowed to apply cosmetics, consume food, tobacco products, or beverage in the regulated work area or any part of the building scheduled for asbestos remediation operations.
- B. Contractor shall establish a location outside the work area, which shall be designated for employee eating and drinking. Employees must utilize the on-site decontamination facilities prior to entering the designated eating and drinking location.

9.07 AIR MONITORING PROGRAM

- A. Personal Air Samples - Contractor Responsibility
 - 1. Contractor must presume Class I, II, and III Asbestos work shall exceed the PEL. Contractor must perform both 30-minute excursion and 8-hour time-weighted average personal air sampling, unless a negative exposure assessment has been established at this location. Minimum air volume for personal air samples (8 hr TWA) shall be 400 liters.
 - 2. Contractor shall perform personal air sampling on a minimum of 25 Percent of the work force performing like tasks (Title 8 CCR 1529). Sample results shall be e-mailed to the Client's Representative within 24 hours of shift end.
- B. Area Sampling – Third-Party Monitor
 - 1. Daily Outside Regulated Area Monitoring.
 - a. The Client's Third-Party Monitor is responsible for monitoring outside the regulated areas. If any sample exceeds 0.01 f/cc, above background level, the Third-Party Monitor shall halt work and notify the Client's Representative. Any sample exceeding 0.01 f/cc may be further analyzed by TEM, at the discretion of the Third-Party Monitor. Work can resume when Contractor has identified and corrected the work practice.
 - 2. Daily Inside Regulated Area Monitoring.
 - a. The Third-Party Monitor is responsible for monitoring air quality (PCM) within the regulated area. Any sample at or above 0.1 f/cc within the regulated area requires a cessation of work until the cause of the problem has been determined and solved (i.e. work practices and engineering controls). Air samples in the work zone that exceed the protection level of a respirator require a cessation of activity. Contractor's Competent Person and the Third-Party Monitor shall review work practices.

9.08 SPECIFIC WORK PROTOCOLS

- A. Approved Work Plan will identify Contractor's specific work protocols for each different type of work and work method.

9.09 INSPECTIONS

- A. Inspection Responsibilities - Contractor
 - 1. Prior to beginning any asbestos-related work, Contractor's asbestos supervisor shall inspect the regulated work areas for any building damage, hazardous conditions, and irregularities that may contribute to an unsafe work environment. Any condition that poses a hazard or potential hazard to Contractor's employees or the Client's community must be immediately reported to the Client's Representative and the Third-Party Monitor.

2. Contractor is responsible for monitoring and enforcing all requirements of this specification.
 3. Contractor is responsible for notifying and allowing sufficient time for the Third-Party Monitor to conduct inspections at all phases of the project.
 4. Contractor shall establish emergency response protocols for a manometer alarm sounding after they have left the project site. Under no circumstances shall Contractor shut off negative air machines, unless the Project has received final clearance.
- B. Inspection Responsibilities – Third-Party Monitor
1. The Client's Third-Party Monitor shall walk the project site with Contractor to verify pre-cleaning operations and any safety or security issues. The Third-Party Monitor shall attend Contractor's safety meetings.
 2. After Contractor has completed set-up and before commencing remediation operations, the Third-Party Monitor shall check the following items for completeness: a regulated area is demarcated and posted, permits are posted, poly sheeting is 6 mil, all HEPA equipment is inspected and in good working condition, electrical tools are connected to GFCI, HVAC is shut off and all ports blocked with two layers of 6 mil polyethylene, electrical panels are tagged and locked out, electrical outlets are sealed with two layers of 6 mil poly, a fire extinguisher is available inside and outside the containment, and water connections are made with a back flow prevention device. If a NPE is used: Contractor shall maintain a minimum of - 0.02 inches of water pressure; the manometer alarm is to remain on until clearance is achieved; one air change every 5 to 15 minutes; 3 stage decontamination is established; air flow is correct as verified by smoke tests, and the shower is functioning with hot and cold water.
 3. Prior to asbestos remediation activities, the Third-Party Monitor shall match on-site personnel with asbestos training certificates, fit tests and medical exam records. Workers without on-site documentation shall not be allowed in the regulated area.
 4. The Third-Party Monitor is responsible for:
 - a. Reviewing all bulk, background, area and personal samples;
 - b. Alerting the Client's Representative of any sample result exceeding 0.1 f/cc.
 5. During remediation activities, the Third-Party Monitor shall check for the following: all personnel are signing in and out of containment, wet methods are being used, debris is collected during and at the end of each shift, workers are properly attired and wearing respirators, work is performed in a safe manner, and an emergency exit is demarcated. The asbestos waste may remain inside the containment, provided access controls are secure. If Contractor cannot guarantee access control, the asbestos waste must be secured in a locked storage container.
 6. After remediation activities are complete and before lockdown or encapsulant is sprayed, the Third-Party Monitor shall verify in accordance with ASTM E1368: completeness of remediation work; all visible dust, debris, and residue are removed, approved lockdown or encapsulants are being used; application amount meets manufacturer specifications, and overspray is controlled. Roof top abatement of non-friable materials does not require the application of a lockdown encapsulant.
 7. If clearance is not achieved, the Third-Party Monitor shall inform the Client's Representative and instruct Contractor to re-clean the regulated work area. After the area is re-cleaned the Third-Party Monitor shall re-sample the regulated area. This process shall continue until the clearance criteria are satisfied. The cost of re-cleaning areas and clearance testing that fails clearance testing will be borne by Contractor.

9.10 ENCAPSULATION, FINAL CLEAN-UP AND RESTORATION

- A. Encapsulation
1. After all waste is removed, wash down all interior surfaces, equipment and supplies.
 2. HEPA vacuum the entire workspace, including, walls, floors and ceiling.
 3. Clean and remove all equipment and supplies.

4. Using an approved encapsulant, spray all surfaces at the manufacturer's pressure and application rates.
- B. Final Clean-Up
 1. After the encapsulation is dry and clearance has been achieved, remove both layers of polyethylene sheeting and dispose as asbestos waste.
 2. Remove critical barriers, negative pressure enclosures, and other sealed openings (HVAC ducts, etc.) as asbestos contaminated waste.
- C. Restoration
 1. Fixtures, equipment or objects relocated to storage areas designated by the Client's Representative shall be restored to their exact original position. Contractor assumes full financial responsibility for damage to these objects.

9.11 HAZARDOUS WASTE DISPOSAL

- A. Contractor shall submit a Work Plan to the Client's Representative prior to the start of work on the project. The Client's Representative will forward the form to the Client's Hazardous Waste Manifest Representative. After reviewing the Asbestos Waste Disposal Plan form, the Hazardous Waste Manifest Representative shall issue a Uniform Hazardous Waste Manifest number to Contractor. A single Uniform Hazardous Waste Manifest Number will be issued per drop box. Contractor's failure to submit this form will result in:
 1. A Uniform Hazardous Manifest Number will not be assigned to the project; and,
 2. Contractor shall assume all fines and penalties imposed by the responsible agency.
- B. Packaging Asbestos Waste
 1. All asbestos containing waste material must be packaged in 1 of 3 ways:
 - a. Placed in 2 clear 6 mil polyethylene bags;
 - b. Placed in sealed drums (DOT approved); or,
 - c. Double wrapped in (AKA "burrito style") in opaque 6-mil polyethylene sheeting.
 - d. For Options "a" and "c" above, wet wipe the outer surface before storing material.
- C. Labeling Asbestos Waste
 1. Each bag, drum, or "burrito" wrap shall have a label affixed with the following information:
 - a. Hazardous waste warning;
 - b. Generator's name, address, and phone number;
 - c. Location information, e.g., Building, department, room;
 - d. Manifest document number, and;
 - e. Accumulation start date.
 2. Each bag, drum, or "burrito" wrap shall have a label affixed with the following:
 - a. DANGER
 - b. CONTAINS ASBESTOS FIBERS
 - c. MAY CAUSE CANCER
 - d. CAUSES DAMAGE TO LUNGS
 - e. DO NOT BREATHE DUST
 - f. AVOID CREATING DUST
- D. Storing Asbestos Waste
 1. At the end of each shift, all asbestos waste shall be stored in a lockable container or shipped off site. Accumulated waste shall not be allowed to remain in the regulated work area overnight. No hazardous waste container shall be allowed to remain on project site for greater than 90 continuous days from date the first bag was stored.
- E. Uniform Hazardous Waste Manifest Procedures
 1. Prior to transporting waste from the project site to a disposal facility, the Contractor shall contact the Client's Hazardous Waste Manifest Representative at least three business days prior to the intended shipping date. A date and time will be arranged for the shipment of the waste. The City Hazardous Waste Manifest Representative will bring all required shipping papers to the jobsite on the date of shipment. Only authorized City personnel can

sign a hazardous waste manifest on behalf of the City of Newport Beach (generator). The Client's EH&S representative will be the office of record for all hazardous waste shipments from the project site. The EH&S representative will also make any notifications of shipments required of hazardous waste generators.

F. Transporting Asbestos Waste

1. A registered waste transporter, hired by Contractor, is responsible for transporting asbestos waste from the project site to an approved landfill, an EPA/DTSC/CIWMB certified disposal facility. The transporter must make pick-ups during normal working hours -- 8:00 a.m. to 5:00 p.m., Monday through Friday. The transporter's vehicle must be clearly marked with warning signs. To avoid illegal transport of asbestos waste, Contractor is responsible for knowing if the project site is contiguous with the main project site. If Contractor must cross public streets to load asbestos waste in the project site containers, Contractor must comply with SCAQMD Rules and DOT requirements for their vehicles.

G. Disposal

1. All hazardous asbestos waste must be disposed of at the approved landfill site. Non-hazardous asbestos may be disposed at any licensed facility. Hazardous and non-hazardous asbestos waste shall be stored in separate containers.
2. Contractor shall provide weight slips and verification of the hazardous waste disposal site to the Client's Representative within 15 days of each shipment. Each weigh slip will be copied by the Client's Representative and sent to the City Hazardous Waste Manifest Representative.

H. Recordkeeping

1. Contractor shall provide the Client's Representative and Third-Party Monitor with copies of all asbestos waste disposal documents.

I. Fees

1. Contractor is responsible for all fees and charges related to asbestos waste transport and disposal operations; including, waste stream profiles. Asbestos content shall be determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy. If the asbestos content is less than 1 percent, additional verification shall be made using the point counting method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1.7.2.4, Polarized Light Microscopy, Quantification of Asbestos Content. All ACM containing greater than 1 percent will be deemed hazardous for waste stream identification purposes.

J. Non-Hazardous Waste Manifest

1. The Client's Representative or designee is responsible for signing non-hazardous waste manifests on behalf of the City. Prior to signing the manifest, the Client's Representative shall inspect the load, secure the transporter's signature, and collect a copy of the form. The Client's Hazardous Waste Manifest representative is not needed to sign a non-hazardous waste manifest.

9.12 CLEARANCE PROTOCOL

A. Remediation Projects

1. "Abatement/removal" – Modified aggressive sampling will be conducted once removal of ACM/ACBM has been completed; regulated area surfaces are free of dust, debris and residue and has passed a visual inspection. After lockdown/encapsulant has settled out and dried (at least 1 hour), use leaf blower(s) or fans may be elected to circulate the air within the negative pressure enclosure (referred to as the modified aggressive sample collection method). Roof top abatement of non-friable material does not require air clearances following final visual inspection.
2. Contractor may initially elect to sample with PCM to get a rough indication of the level of air quality.
3. To pass clearance, air samples will be collected and analyzed by either NIOSH 7402 method or 40 CFR Part 763, Appendix A to Subpart E, TEM analytical methods. When

- approved in advance, PCM clearance at <0.01 f/cc may be used with a minimum air volume of 1,200 liters.
4. The Client's Third-Party Monitor following EPA guidelines, shall select the total number of clearance samples needed, number of blanks, location of samples, and volume rate requirements.
 5. Any sample result exceeding 0.01 fibers per cubic centimeter (f/cc) or 70 structures per millimeter squared (S/mm²) requires Contractor to re-clean at no additional expense to the City.
 6. Exception: Since roofing jobs are not conducted within a negative pressure enclosure, representative sampling, using PCM, is collected downwind from the project. Visual inspection will be conducted only.

9.13 PROJECT CLOSE OUT

- A. Before the certificate for payment for work covered by this section is issued to Contractor the following information shall be provided to the Client's Representative:
 1. Provide close out package, to include:
 - a. Contractor's name, address, CSLB certification number, DOSH registration number, and tax identification number.
 - b. Name of hazardous materials transporter, address, phone number and registration number.
 - c. NVLAP laboratory name(s), address(es), and phone number(s) used to perform PCMs, TEMs, or PLMs.
 - d. Building owner's name.
 - e. Building name and project site address
 - f. Project name and contract number
 - g. Describe scope of work; including, location (room numbers, approximate square footage, building system types).
 - h. Provide an inventory of the ACM/PACM removed from the project site. Include; building system, class(es), quantity, note whether the project was remediation (interim-controls) or abatement (complete removal, in the work area), note whether the building system(s) was replaced (use yes or no), and the percentage of the total contract each building system abated or managed in-place represents.
 - i. Total dollar amount paid by the City of Newport Beach for asbestos-related work including invoice date(s) and date(s) payment received.
 - j. Number of employees who worked on the project and information as identified in Recordkeeping paragraph in this section.
 - k. Date on-site work began.
 - l. Date on-site work was completed.
 - m. Work methods
 - n. Did the City provide specification (answer yes or no)
 - o. Name, address, phone number and EPA registration number of waste disposal site.
 - p. All weigh slips shall be provided as required in the "WASTE DISPOSAL" article of this specification.
- B. Documentation
 1. Contractor shall provide copies of all laboratory reports, Asbestos work protocols, and disposal documents requested by the Client's Representative.

END OF SECTION

**SECTION 02 83 00
LEAD HAZARD CONTROL**

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. 29 CFR 1910.134 - Respiratory protection; Current Edition.
- C. 29 CFR 1926.62 - Lead; current edition.
- D. 40 CFR 261 - Identification and Listing of Hazardous Waste; Current Edition.
- E. UL 586 - High Efficiency, Particulate, Air Filter Units; Current Edition, Including All Revisions.

1.02 1.01 SUMMARY

- A. This section specifies the Contractor's requirements and responsibilities for controlling lead hazards associated with the project. Lead-containing paint (LCP) was identified in subject areas. Refer to hazardous material survey provided in ASBESTOS AND LEAD SURVEY REPORT and TABLE 1 below for materials containing lead above laboratory detection levels. The Contractor shall refer to the existing survey report for specific locations of LCP identified in the survey. Contractor and subcontractors will verify all quantities in the field. For the purpose of this Section, LCP is defined as any paint containing a measurable amount of lead. The Contractor shall perform all work in accordance with applicable federal, state, and local regulations. The objective is to prevent lead exposure to workers, occupants, the public, and the environment.
- B. The Contractor shall ensure that all employees and subcontractors involved in disturbing or removing hazardous materials have access to the survey report and information in this Section so they can understand and control the associated hazards.

TABLE 1 – LEAD CONTAINING MATERIALS AT PROJECT SITE

BUILDING	MATERIAL DESCRIPTION	METAL	RESULTS (MG/KG)	APPROX. QUANTITY*
FIRE DEPARTMENT / 2ND FLOOR / BATHROOM	LARGE FORMAT SPECKLED WALL & FLOOR TILE	LEAD	0.9	150 FT2
FIRE DEPARTMENT / 2ND FLOOR / BATHROOM / SHOWER WALL	4"X4" WHITE CERAMIC TILE	LEAD	1.9	80 FT2
FIRE DEPARTMENT / 2ND FLOOR / KITCHEN / COUNTERTOP	4"X4" BEIGE CERAMIC TILE	LEAD	2.2	100 FT2
EXTERIOR / ROOF / WOOD TRIM	MAROON PAINT	LEAD	396	700 FT2
FIRE DEPARTMENT / 1ST FLOOR / GARAGE / WALLS	DARK GREY, LIGHT GREY, WHITE & TAN PAINT	LEAD	307	1550 FT2
FIRE DEPARTMENT / 1ST FLOOR / TOOL ROOM DOORWAY	WHITE, GREY & TAN PAINT	LEAD	111	100 FT2

TABLE 1 – LEAD CONTAINING MATERIALS AT PROJECT SITE

BUILDING	MATERIAL DESCRIPTION	METAL	RESULTS (MG/KG)	APPROX. QUANTITY*
FIRE DEPARTMENT / 1ST FLOOR / BATHROOM & LAUNDRY / WALLS	WHITE, GREY & TAN PAINT	LEAD	1320	360 FT2
FIRE DEPARTMENT / 1ST FLOOR / BATHROOM DOOR	DARK GREY & TAN PAINT	LEAD	5.4	40 FT2
FIRE DEPARTMENT / 1ST FLOOR / DOOR TO GARAGE	RED PAINT	LEAD	23.8	80 FT2
FIRE DEPARTMENT / 2ND FLOOR / BATHROOM / WALLS	WHITE, BEIGE & TAN PAINT	LEAD	50.4	180 FT2
FIRE DEPARTMENT / 2ND FLOOR / LOCKER ROOM / WALLS	WHITE, BEIGE & TAN PAINT	LEAD	892	620 FT2
FIRE DEPARTMENT / 2ND FLOOR / OFFICE / WALLS	WHITE & TAN PAINT	LEAD	206	1050 FT2
EXTERIOR / ROOF / ROOF VENT & FLASHINGS	RED PAINT	LEAD	87100	100 FT2
EXTERIOR / LIBRARY / ENTRY WALL	YELLOW PAINT	LEAD	301	2670 FT2
LIBRARY / NON-FICTION NORTH / WALLS	CREAM PAINT	LEAD	1160	1120 FT2
LIBRARY / NON-FICTION NORTH / CEILING BEAMS & CEILING	OFF-WHITE PAINT	LEAD	16200	860 FT2
LIBRARY / NAUTICAL ROOM / WEST DOOR FRAME & WALLS	LIGHT BLUE & WHITE PAINT	LEAD	45.3	680 FT2
LIBRARY / CHILDREN'S ROOM / NORTH WALL PILLAR	BLUE & CREAM PAINT	LEAD	5.9	400 FT2

TABLE 1 – LEAD CONTAINING MATERIALS AT PROJECT SITE

BUILDING	MATERIAL DESCRIPTION	METAL	RESULTS (MG/KG)	APPROX. QUANTITY*
LIBRARY / HALLWAY AT BATHROOMS / STORAGE CLOSET DOOR FRAME	WHITE PAINT	LEAD	69.9	210 FT2
LIBRARY / BATHROOM A & B / WALLS	OFF-WHITE & OLIVE PAINT	LEAD	1040	520 FT2
LIBRARY / PANTRY / COUNTERTOP	4" CREAM CERAMIC TILE	LEAD	17.5	12 FT2
LIBRARY / READING ROOM / WALLS	CREAM & OLIVE PAINT	LEAD	805	5500 FT2
LIBRARY / STAFF BATHROOM & PANTRY / WALLS	OFF-WHITE, TAN & OLIVE PAINT	LEAD	204	280 FT2
LIBRARY / STAFF BATHROOM / WINDOW LEDGE	OFF-WHITE & TAN PAINT	LEAD	132	10 FT2

***CONTRACTOR TO VERIFY ALL QUANTITIES IN THE FIELD**

LEAD BASED PAINT >5000 MG/KG, LEAD CONTAINING PAINT ???TTLT LIMIT (1000 MG/KG

1.02 PRELIMINARY

- A. In performing renovation or demolition of surfaces with LCP, all possible safeguards, precautions, and protective measures shall be utilized to prevent exposure of any individuals to lead.
- B. The disturbance of lead-containing materials may cause lead dust and fumes to be released into the atmosphere, thereby creating a potential health hazard to workers, other personnel, and the public within the project area. The Contractor shall apprise all workers, supervisory personnel, subcontractors, and Third-Party Monitors who will be at the job site of the potential health hazards and of proper work procedures, which must be followed when disturbing LCP.
- C. The Contractor and his/her subcontractors shall review the plans and specifications and shall ensure that all workers, including subcontractors, fully understand its contents.
- D. The Contractor and his/her subcontractors shall inform their respective employees and other individuals performing work in and around the areas of the presence of LCP at the project site.
- E. The Contractor shall take appropriate and continuous measures and methods to provide all necessary information and devices, as necessary, to protect all workers from the potential hazards of lead exposure through respirable airborne dust. Such measures shall comply with applicable federal, state, and local regulations.
- F. The Contractor shall assure that only workers who have been trained in accordance with the U.S. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard [29 Code of Federal Regulations (CFR) 1926.62] and California Occupational Safety and Health Division (CAL-OSHA) California Code of Regulation (CCR) Title 8, 1532.1 are allowed to perform the work specified in this Section.

- G. All work under this contract shall be performed in strict accordance with all applicable federal, state, and local regulations, standards, and codes governing the preparation, treatments, handling, storage, transport, and disposal of lead containing materials. The most recent edition of the aforementioned shall govern the execution of this project.

1.03 PATENTED DEVICES, MATERIAL AND PROCESS

NOT APPLICABLE.

- A. WORK SPECIFIED IN THIS SECTION
- B. The Contractor shall control the dust during this project in accordance with laws, regulations, and current best work practices. It is the responsibility of the Contractor to understand the potential lead hazard. The work covered by this Section includes the incidental procedures and equipment required to protect workers, staff, occupants, and the public from contact with lead, as well as to protect the environment.
- C. Perform work in accordance with 29 CFR 1910.1025, 29 CFR 1926.62, CAL-OSHA CCR Title 8 1532.1, and the requirements specified herein.

1.05 COORDINATION WITH OTHER SECTIONS

- A. Prior to commencement of work, an annotated description of all existing damaged and missing items shall be submitted to the Client. It will be the Contractor's responsibility to repair and/or replace all items identified as damaged and/or missing to the Client's satisfaction that cannot be proven to have been in this condition prior to the commencement of this project.
- B. Related Documents are:
 - 1. ASBESTOS AND LEAD SURVEY REPORT, includes survey report.

1.06 SUBMITTALS

- A. Before start of work, submit the following to the Client or their representative for review. Do not begin work until these submittals are returned with the Client's approval indicating that the submittal is returned for unrestricted use.
 - 1. Statements
 - a. Lead Hazard Control Plan: Submit a detailed job-specific plan of the work procedures to be used in the work to control the LCP. The Plan shall include, but is not limited to, a clear scope of work and methods to control lead hazards.
 - b. Training Certificates: Submit a copy of all workers OSHA/CAL-OSHA required "Lead in Construction" training.
 - 2. Records
 - a. Laboratory Analytical Results: Submit copies of air monitoring or other testing results, where applicable, to the Client or their representative within 24-hours of receipt from the laboratory.
 - b. Uniform Hazardous Waste Manifest Form: Submit completed Uniform Hazardous Waste Manifest Form, where applicable.
 - c. Manufacturer's Safety Data Sheets (SDS): Submit for paint stripping materials, where applicable.
- B. PRODUCT HANDLING
- C. Material that becomes contaminated with lead shall be disposed of in accordance with applicable regulations. The contractor is responsible for the characterization and disposal of waste.

1.08 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
 - 1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
 - a. ANSI Z88.2 1980 Practice for Respiratory Protection
 - 2. CODE OF FEDERAL REGULATIONS (CFR)
 - a. 29 CFR 1910.134 Safety and Health Standards (Respiratory Protection)

- b. 29 CFR 1910.1025 Safety and Health Standards (Lead)
- c. 40 CFR 61 Sub A & B General Provisions
- d. 40 CFR 61 Sub M National Emissions Standard for Hazardous Air Pollutants (NESHAPS)
- e. 40 CFR 260 Hazardous Waste Management System: General
- f. 40 CFR 261 Identification and Listing of Hazardous Waste
- g. 40 CFR 262 Standards for Generators of Hazardous Waste
- h. 40 CFR 263 Standards for Transport of Hazardous Waste
- i. 40 CFR 264 Standard for Architects and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- j. 40 CFR 265 Interim Status Standards for Architects and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- k. 40 CFR 268 Land Disposal Restrictions
- l. 40 CFR 745 Training, certifications, notifications
- m. 40 CFR 763 Sub G Worker Protection Rule
- n. 49 CFR 171 & 172 Transportation of Hazardous Waste
- 3. U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
 - a. Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in housing
- 4. UNDERWRITERS LABORATORIES, INC. (UL)
 - a. UL 586 1990 High-Efficiency, Particulate, Air Filter Units
- 5. UNIFORM FIRE CODE (UFC)
 - a. U.F.C Standard 10-1 Portable Fire Extinguishers
 - b. U.F.C. 8704.4.2 Fire Safety During Construction – Fire
- 6. CALIFORNIA CODE OF REGULATIONS (CCR)
 - a. Title 8 CCR 5198 General Industry Safety Orders – Lead
 - b. Title 8 CCR 5144 Respiratory Protection
 - c. Title 8 CCR 5194 Hazard Communication
 - d. Title 8 CCR 1509 Injury Illness Prevention Program (IIPP)
 - e. Title 8 CCR 1532.1 Construction Industry Safety Orders – Lead
 - f. Title 8 CCR 3380-85 Personal Protection
 - g. Title 17 Section 35001 - 36100 Accreditation, Certification, and Work Practices For Lead-Based Paint and Lead Hazards
 - h. Title 22 Division 4, Ch. 30 Hazardous Waste Handling
- 7. CALIFORNIA LABOR CODE
 - a. Section 6501.5 – 6505.5
- 8. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD), LEAD-BASED PAINT
 - a. Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, June 1995
- 9. AIR POLLUTION CONTROL DISTRICTS
 - a. NESHAPS Rule varies according to district
- 10. LOCAL CITY AND COUNTY RULES
 - a. Article 4, Division 10 Section 54.1001 – 54.1015 & Appendix A
 - b. Check with local fire department and other applicable city agencies

1.09 GENERAL REQUIREMENTS

- A. Title to Materials: Waste material resulting from the work shall be disposed of as specified herein.
- B. Medical Examinations: Before exposure to lead dust, the Contractor shall provide workers with a comprehensive medical examination as required by Title 8 Section 1532.1, where applicable. Examination is not required if records show the employee has been examined as required by Title 8 Section 1532.1 within the past year. Maintain complete and accurate records of

employees' medical records for a period of 40 years or 20 years after termination of employment, whichever is longer.

- C. Training: Within one year prior to assignment to lead work, each employee shall receive training with regard to the hazards of lead, safety and health precautions, the use and requirements for protective clothing, equipment, and respirators, and the additional requirements of Title 8 Section 1532.1. Furnish each employee with a respirator fit test as required by Title 8 Section 1532.1. Fully cover engineering and other hazard control techniques and procedures.
- D. Respirator Program: Establish and implement a respirator program as required by ANSI A88.2, Title 8 Section 1532.1, and Title 8 Section 5144.
- E. Health and Safety Compliance: In addition to detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of Title 8 Section 1532.1. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where specification requirements and referenced documents vary, the most stringent requirement shall apply.

1.10 DEFINITIONS

- A. Area Monitoring: Sampling of lead concentrations within the lead Regulated area and outside the lead Regulated area, which is representative of the airborne concentrations of lead that may reach the breathing zone of personnel potentially exposed to lead.
- B. Lead: Metallic lead, all inorganic lead compounds, and inorganic lead soaps. Excluded are all other organic lead compounds.
- C. Lead Regulated Area: An area where lead removal operations are performed which is isolated by physical boundaries to prevent unauthorized entry of personnel and to prevent the spread of lead dust, paint chips, or debris.
- D. Lead Permissible Exposure Limit (PEL): The limit is 10 micrograms per cubic meter of air as an 8-hour time-weighted average (TWA) as determined by Appendix A of Title 8 Section 1532.1.
- E. Action Level (AL): The AL for an 8-hour TWA exposure to airborne lead is 2 micrograms per cubic meter.
- F. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead dust.
- G. Personal Monitoring: Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour TWA in accordance with Title 8 Section 1532.1. The samples shall be representative of the employee's work tasks. The breathing zone shall be considered an area within 12 inches of the nose or mouth of an employee.
- H. Time-Weighted Average (TWA): The TWA is an 8-hour time-weighted average of airborne lead per cubic meter of air, which represents the employee's 8-hour workday as determined by Title 8 Section 1532.1.
- I. Third Party Monitor's Representative: A qualified person(s) designated by the Third-Party Monitor to perform work as designated in the specifications.

PART 2 - PRODUCTS

10.01 NOT USED.

PART 3 - EXECUTION

11.01 3.01 PREPARATION PRIOR TO DISTURBANCE OF LEAD-CONTAINING PAINT

- A. The Contractor shall document existing paint conditions prior to any work (exterior and interior). Where applicable, the Contractor shall pre-clean horizontal surfaces within the work area prior to disturbing existing LCP.

- B. The Contractor shall perform the work minimizing lead dust by the use of wet methods and tools with HEPA collection devices. If air monitoring indicates control measures are inadequate, the Contractor shall stop work and implement enhanced engineering controls.
- C. The Contractor shall establish a lead regulated area, where lead removal operations are performed. Isolate the portions of the building or area not within the scope of work using 6-mil polyethylene sheeting, where feasible.
- D. The Contractor shall demarcate the exterior lead regulated area using lead warning tape, where required. Lead warning tape should be at least 20 feet away from the closest painted surface being disturbed.

3.02 ACTIVITIES DISTURBING LEAD-CONTAINING PAINT

- A. The Contractor shall perform LCP removal or demolition as indicated on the plans, minimizing lead dust by the use of wet methods and tools with HEPA collection devices. If air monitoring indicates control measures are inadequate, the Contractor must stop work, notify the Third-Party Monitor, and implement enhanced engineering controls immediately.
- B. The Contractor shall not perform dry removal or dry sweeping. Wastes or paint debris generated during removal shall be promptly staged or packaged and shall not be allowed to accumulate uncontrolled beyond the end of the shift. Where applicable, lead-containing wastes shall be properly marked and stored in marked and appropriate secured containers. The Contractor shall not allow lead-containing wastes to be (1) stored outside the lead Regulated area, (2) in a high traffic unsecured area, (3) or where the waste could interact with rainfall or wind and create a secondary hazard or contamination.

3.03 LEAD CONCENTRATIONS IN THE WORK AREA

- A. The maximum permissible exposure to airborne concentrations of lead within the work area shall be in accordance with 29 CFR 1926.62 and CAL-OSHA Title 8 CFR Section 1532.1. The work shall stop whenever these limits are exceeded, and the Contractor shall remedy the condition prior to commencing work.
- B. Instruct and train each worker in proper respiratory use. Require that each worker wear a respirator, properly fitted on the face, in the work area from the start of any operation which may cause airborne lead dust until the work area is completely decontaminated. Use respiratory protection appropriate for the lead dust levels encountered in the workplace or as required for other toxic or oxygen-deficient situations encountered.
 - 1. Air Purifying Respirators: Provide half face or full-face type respirators. Equip full face respirators with a nose cup or other anti-fogging device as appropriate.
 - 2. Filter Cartridges: Provide, at a minimum, HEPA type filters labeled with the National Institute for Occupational Safety and Health (NIOSH) Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Asbestos-Containing Dusts and Mists" and color coded in accordance with ANSI Z228.2 (1980). In addition, a chemical cartridge section may be added, if required, for solvents, etc., in use. In this case, provide cartridges that have each section of the combination canister labeled with the appropriate color code and NIOSH Certification.
 - 3. Non-permitted respirators: Do not use single use, disposable or quarter-face respirators.
 - 4. Require that respiratory protection be used at all times that there is any possibility of disturbance of lead-containing materials, whether intentional or accidental.
 - 5. Require that a respirator be worn by anyone in a lead Regulated area at all times when LCP is disturbed, regardless of activity, during a period that starts with any operation which could cause airborne lead dust until the area has been cleared for re-occupancy.
 - 6. Regardless of Lead Dust Levels: Require that the minimum level of respiratory protection used be half-face air-purifying respirators with high efficiency particulate air filters.
- C. Fit Testing
 - a. Initial Fitting: Provide initial fitting of respiratory protection during a respiratory protection course of training. Fit types of respirators to be actually worn by each

individual. Allow an individual to use only those respirators for which training and fit testing have been provided.

- b. On an Annual Basis, check the fit of each worker's respirator by having irritant smoke blown onto the respirator from a smoke tube.
- c. Upon Each Wearing: Require that each time an air-purifying respirator is put on it will be checked for proper fitting with a positive and negative pressure fit test in accordance with the manufacturer's instructions or ANSI Z88.2 (1980).

D. Type of Respiratory Protection Required

- 1. Provide Respiratory Protection as indicated in paragraph below. Higher levels of protection may be provided as desired by the Contractor, or as directed by the Third-Party Monitor. Where the paragraph below does not apply, determine the proper level of protection by dividing the expected or actual airborne lead dust count in the work area by the "protection factors" given below.
 - a. Use the following unless air monitoring results indicate greater protection is necessary. Refer to the Protection Factors table for choice of respirators.
 - b. Loose equipment cleaning prior to removal in uncontaminated area: Half-face dual cartridge-type respirator.
 - c. Plastic installation which does not disturb LCP: Half-face dual cartridge type respirator.
 - d. Removing or cleaning items or plastic installation when such operation may disturb LCP or dust: Dual Cartridge, Half-face Air Purifying Respirators.
 - e. Lead-containing material removal: Dual Cartridge, Half-face Air Purifying Respirators.
 - f. Gross cleaning of removal area(s): Dual Cartridge, Half-face Air Purifying Respirators.
 - g. Lead-Containing Paint removal: Dual Cartridge, Half-face Air Purifying Respirators.

PROTECTION FACTORS

RESPIRATOR TYPE	MAXIMUM USE CONCENTRATION
AIR PURIFYING: NEGATIVE PRESSURE RESPIRATOR HIGH EFFICIENCY FILTER, HALF FACEPIECE	UP TO 100 UG/M3
AIR PURIFYING (PAPR): NEGATIVE PRESSURE RESPIRATOR HIGH EFFICIENCY FILTER FULL FACEPIECE	UP TO 500 UG/M3
POWERED-AIR PURIFYING POSITIVE PRESSURE RESPIRATOR HIGH EFFICIENCY FILTER HALF OR FULL FACEPIECE OR TYPE C SUPPLIED AIR: POSITIVE PRESSURE RESPIRATOR, CONTINUOUS-FLOW HALF OR FULL FACEPIECE	UP TO 10,000 UG/M3

3.04 PROTECTIVE CLOTHING

- A. Furnish personnel with disposable protective whole-body clothing, head covering, gloves, and foot coverings, when an employee is exposed to lead above the PEL without regard to the use of respirators, where employees are exposed to lead compounds which may cause skin or eye irritation (e.g. lead arsenate, lead azide), and as interim protection for employees performing tasks monitored during exposure assessment, Furnish disposable plastic or rubber gloves to protect hands, where applicable.

3.05 WARNING SIGNS AND LABELS

- A. Provide warning signs at approaches to the lead Regulated areas, where employees exposures to Lead are above the PEL. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Provide and affix labels to impermeable bags, lead waste drums, and other containers containing lead materials, scrap, waste, or debris. Signs and labels shall comply with the requirements of Title 8 Section 1532.1.

3.06 TOOLS

- A. Filters on vacuums and exhaust equipment shall be absolute HEPA filters and UL 586 labeled.

3.07 AIR MONITORING

- A. Employee Monitoring: When trigger tasks are performed as defined by OSHA Lead in Construction standard, the Contractor shall monitor employees' exposure to lead in accordance with OSHA requirements. The Contractor shall collect air samples from employees' breathing zones during each shift, for the duration of the lead-disturbing work. The Contractor shall collect samples from at least 25% of workers performing lead-disturbing tasks, and not less than two workers.
- B. Work area and Adjacent Areas: Where paint abatement is conducted, the Consultant will perform area air monitoring outside the enclosures to determine the effectiveness of work practice controls where Lead containing paint removal is conducted.
- C. Air Sampling Procedures:
 - a. The sampling medium shall be mixed cellulose ester filter membranes with a pore size of 0.8 microns. The collection device shall be a 37-mm, non-conductive extension cowl and will include a backup pad for the filter. The air flow rate shall be between 1.0 liter/min and 4.0 liters/min. Where possible, a sufficient air volume of each air sample shall be collected to yield at least 240 liters. If a filter darkens in appearance or if loose dust is seen on the filter, a second sample shall be started. Each personal sampling pump will be calibrated before and after use with a representative filter cassette installed between the pump and the calibration devices. The device used to perform the calibration, if not a primary standard, shall have been calibrated within at least the past three months against a primary standard. Calibration charts/curves should be kept on site. Personal samples shall be taken in the breathing zone of the employee. The samples will be shipped in a rigid container with sufficient packing material to prevent dislodging the collected dust. Packing material that has a high electrostatic charge on its surface cannot be used because such material can cause loss of dust to the sides of the cassette. Analysis shall be made by an accredited laboratory by ICP (in accordance with NIOSH Method 7300).

3.08 STOP ACTION LEVELS

- A. Inside Work Area: Maintain airborne levels in the work area of less than the Stop Action Level given below for the type of respiratory protection in use. If the lead dust levels rise above this figure for any sample taken, revise work procedures to lower ambient dust levels. If lead dust levels for any work shift or 8-hour period exceeds the Stop Action Level, stop all work except corrective action and notify the Third-Party Monitor's representative. After correcting the cause of lead dust levels, do not re-commence work for 24 hours unless otherwise authorized, in writing, by the Third-Party Monitor's representative.

LEAD STOP ACTION LEVEL (MG/M3)	RESPIRATOR REQUIRED	PROTECTION FACTOR
100	HALF FACE	10
10,000	PAPR OR TYPE C, CONTINUOUS FLOW	1,000

100,000	TYPE C, PRESSURE DEMAND	10,000

- B. If the high reading was the result of a failure of work area isolation measures, initiate the following actions:
 - 1. Decontaminate the affected area(s).
 - 2. Require that respiratory protection be worn in affected area until the area is cleared for re-occupancy.
 - 3. After a Certification of Visual Inspection has been completed for the work area, final wipe samples will be collected from the work area, where warranted. If these samples are below regulatory limits, remove barriers separating the work area from the affected area.
- C. If the high reading was the result of other causes, initiate corrective action as determined by the Third-Party Monitor's representative.
- D. Effect on Contract Sum
 - 1. Complete corrective work with no change in the Contract Sum if lead dust levels were caused by Contractor's activities. All costs involving additional lead air and/or wipe sample analysis will be borne by Contractor.

3.09 ANALYTICAL METHODS

- A. The following methods shall be used in analyzing filters used to collect air samples. The filters used shall be in accordance with the referenced methods. Samples collected for lead analysis shall be collected and analyzed utilizing the NIOSH 7082 method.

3.10 AIR SAMPLE MEDIA

- A. Lead Sample Cassettes: Samples will be collected on 37-millimeter (mm) cassettes with 0.8 micrometer cellulose ester membrane.

3.11 LABORATORY TESTING

- A. The services of a testing laboratory shall be employed by the Contractor to obtain air samples as indicated and to perform laboratory analyses of air samples collected by the Contractor. Where applicable, Lead air sample results will be made available to the Third-Party Monitor no later than five days after sample collection, and within 24 hours after the receipt of laboratory analytical results.
- B. The Client or Client representative will have access to all air monitoring tests and results.

3.12 CLEAN UP

- A. Where lead abatement occurs, the Contractor shall maintain surfaces of the lead Regulated area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the general project area. Do not dry sweep the area. When the paint removal and demolition is complete, clean all visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner followed by wet mopping if vacuuming is not effective. The Contractor shall certify that the work was performed in accordance with 29 CFR 1910.1025, and that there are no visible accumulations of lead-containing paint and dust on the work site. The Contractor and the IH will visually inspect the affected surfaces for residual lead paint chips and accumulated lead dust after the work is completed. The Contractor shall re-clean areas showing lead dust or residual lead paint chips.
- B. The Contractor is responsible for the restoration and cleaning of any areas outside the work area impacted by or contaminated by lead dust or debris generated by the Contractor's removal, handling, or storage of lead-containing waste. The Contractor shall perform remedial cleaning and restoration of these areas, if any, at no additional cost to the Client.

3.13 CLEARANCE

- A. Where lead abatement occurs, the Contractor and the Third-Party Monitor shall visually inspect the affected surfaces for residual lead paint chips and accumulated dust. No surface wipe sampling will be performed, unless determined as necessary by the Third-Party Monitor.

- B. Where lead abatement occurs, the Contractor and the Third-Party Monitor shall visually inspect exterior areas adjacent to the work area for lead paint chips or debris. The contractor shall restore any areas impacted by lead dust or debris from the removal work to their original condition.

3.14 DISPOSAL

- A. The Contractor shall be responsible for the characterization of waste streams generated during the project.
- B. If the local landfill requires, a representative sample of the waste generated during the removal work will be collected and analyzed by an approved laboratory for Toxicity Characteristic Leachate Procedure (TCLP) analysis. If analytical result indicates the TCLP level is below the U.S. Environmental Protection Agency (EPA) guideline or within landfill acceptance criteria, the waste generated during the renovations can be disposed of as general construction debris. If the TCLP test fails, or exceeds the landfill acceptance criteria, the wastes shall be treated as hazardous waste and be disposed of in a Resource Conservation Recovery Act (RCRA) permitted landfill. The waste manifest must be signed by a City of Newport Beach representative or designee.
- C. The Contractor shall submit a copy of the TCLP analytical results, if performed, Hazardous Waste Manifest, and Landfill Receipt, to the Third-Party Monitor within 48 hours of receipt.

3.15 GENERAL

- A. All waste is to be hauled by a waste hauler with all required licenses from all state and local authority with jurisdiction.
- B. Protect interior of truck or dumpster with Critical and Primary Barriers.
- C. Carefully load containerized waste in fully enclosed dumpsters, trucks, or other appropriate vehicles for transport. Exercise care before and during transport, to ensure that no unauthorized persons have access to the material. Vehicle must be placarded with a Department of Transportation (DOT) label.
- D. Do not store containerized materials outside of the work area. Take containers from the work area directly to a sealed truck or dumpster.
- E. Do not transport lead waste materials on open trucks. If waste material is to be transported in drums, label drums with the same warning labels as bags. Uncontaminated drums may be reused. Treat drums that have been contaminated as lead paint waste and dispose of them in accordance with this specification.
- F. Advise the hazardous waste storage facility in advance of transport and of the quantity of material to be delivered.
- G. Retain receipts from hazardous waste storage for materials disposed of. After completion of hauling disposal of each load, submit copies of waste manifest, chain of custody form, and hazardous waste storage facility receipt to the Client or their representative. The final contract payment will not be made until all documents are submitted.

END OF SECTION

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SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: All labor, materials and equipment and all operations required to complete all formwork as indicated on the drawings; to produce shapes and configurations as shown, as required; and as specified herein, including:
 - 1. Forms, shores, bracing, removal and other operations as necessary for all cast-in-place concrete and masonry placed.
 - 2. Setting and securing anchor bolts and other metal items embedded in concrete into formwork, using materials and layouts furnished and delivered to jobsite as specified under other sections.
- B. Related Sections:
 - 1. Pertinent Sections of Division 03 specifying concrete construction.
 - 2. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete foundations and formwork.

1.02 REFERENCES

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 19 Concrete.
- B. American Concrete Institute (ACI) PRC-347 "Guide to Formwork for Concrete".
- C. American Plywood Association (APA) "Concrete Forming Guide".
- D. West Coast Lumberman Inspection Bureau (WCLIB) "Standard Grading Rules for West Coast Lumber".
- E. ACI MNL-066 "ACI Detailing Manual".
- F. ACI SPEC-301 "Specifications for Concrete Construction".
- G. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".

1.03 DESIGN REQUIREMENTS

- A. Design, engineer, and construct formwork, shoring and bracing to conform to design and code requirements, resist imposed loads; resultant concrete to conform to required shape, line and dimension.

1.04 SUBMITTALS

- A. Limitation of review: Structural Engineer's review will be required only where specifically requested for general architectural applications and features only. Contractor is responsible for structural stability, load-resisting characteristics and sufficiency of form work design.

1.05 QUALITY ASSURANCE

- A. General: All form materials shall be new at start of work. Produce high quality concrete construction. Minimize defects due to joints, deflection of forms, roughness of forms, nonconforming materials, concrete or workmanship.
- B. Reuse of Forms: Plywood forms may be reused, if thoroughly cleaned of all dirt, mortar, and foreign materials, and undamaged at edges and contact face. Reuse shall be subject to permission from the Architect without exception, and issued in writing. Reuse of any panel which will produce a blemish on exposed concrete, will not be permitted.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Form Materials:
 - 1. Non-Exposed Surface Formwork Facing: Forms for concrete which is not exposed to view, may be of plywood as specified for exposed surfaces, or square edge 1x nominal Douglas Fir, Construction Grade, S4S.
 - 2. Exposed Surface Formwork Facing:
 - a. Forms for all exterior and interior concrete flat surfaces unless otherwise specified as board formed shall be new Douglas Fir Plywood (APA) ply, 5/8-inch, B-B Plyform, Class 1, Exterior Type, oiled and edged and edge-sealed conforming to U.S. Product Standard PS 1 in large sheet sizes to achieve joint patterns shown.
 - b. All exposed concrete edges shall be chamfered 3/4" minimum or as noted on the drawings.
 - 3. Exposed Surface Formwork - Special Pattern Form Liner:
 - a. Forms for all exterior and interior concrete flat surfaces indicated shall be as designated by Architect.
- B. Earth Forms: Allowed, subject to soil standing in excavations without ravel or caving.
- C. Form Release Agent: Spray-on compound, not affecting color, bond or subsequent treatment of concrete surfaces. Maximum VOC content shall comply with local requirements and California Green Building Code.
- D. Accessories: Types recommended by manufacturers or referenced standards to suit conditions indicated;
 - 1. Anchors, spacers, void in-fill materials: sized to resist imposed loads.
 - 2. Form Ties: Prefabricated rod, flat band, or wire snap ties with 1" break-back or threaded internal disconnecting type with external holding devices of adequate bearing area. Ties shall permit tightening and spreading of forms and leave no metal closer than 1" to surface.
- E. Corner Chamfers and Rustications: Filleted, wood strip or foam type; sizes and shapes as detailed, or 3/4 x 3/4 inch size minimum if not detailed; maximum possible lengths.
- F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- G. Foam Block Formwork: For use only where specified on drawings to create void space under or within concrete. ASTM D6817.

Use Case	InsulFoam Geofoam (or equivalent)	Maximum Density (pcf)	Compressive Resistance at 1% Deformation (psi)	Compressive Resistance at 5% Deformation (psi)	Compressive Resistance at 10% Deformation (psi)
1) Void formwork	EPS-15	0.90	3.6	8.0	10.2
2) Planters	EPS-19	1.14	5.8	13.1	16.0
3) Pedestrian Loads (≤100psf)	EPS-22	1.35	7.3	16.7	19.6
4) Vehicular Loads and Sidewalks (≤ 250psf)	EPS-39	2.40	15.0	35.0	40.0

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Inspect the substrate and the conditions under which concrete formwork is to be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates and conditions.
- B. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

- A. If natural soil or compacted fill can be accurately cut and maintained, foundations and grade beams may be poured against earth without forming. Provide positive protection of trench top corners.
- B. Maintain earth forms free of water and foreign materials.

3.03 ERECTION – FORMWORK

- A. General: Construct formwork in accordance with calculations, and recommendations of ACI PRC-347. Construct forms to the sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finished structure. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes.
 - 1. Construct cambers specified in concrete members and slabs in the formwork.
 - 2. Schedule the work and notify other trades in ample time so that provisions for their work in the formwork can be made without delaying progress of the project. Install all sleeves, pipes, etc. for building services systems, or other work. Secure information about and provide for all openings, offsets, recessed nailing blocks, channel chases, anchors, ties, inserts, etc. in the formwork before concrete placement.

3. Deflection: Formwork and concrete with excessive deflection after concrete placement will be rejected. Excessive deflection is that which will produce visible and noticeable waves in the finished concrete.
 4. Measure formwork for elevated structural slabs, columns, wall elevations points of maximum camber and submit in writing to the Architect/Engineer prior to placing concrete.
- B. Formwork Construction: Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301. Uniform, substantial and sufficiently tight to prevent leakage of concrete paste, readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials. Tie, brace, shore, and support to insure stability against pressures from any source, without failure of any component part and without excessive deflection. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
 - C. Provide all openings, offsets, inserts, anchorages, blocking, and other features of the work as shown or required. See INSERTS, EMBEDDED PARTS, AND OPENINGS for detailed requirements.
 - D. Warped, checked, or scuffed forms will be rejected.
 - E. Maintain membranes, reinforcing and other work free of damage; protect with plywood runway boards or other positive, durable means.
 - F. Align joints and make watertight. Keep form joints to a minimum.
 - G. Provide fillet and chamfer strips on external corners of exposed locations and as indicated to form patterns in finished work. Extend patterns around corners and into alcoves, on backs of columns and similar locations not otherwise shown.
 1. Produce beveled, smooth, solid, unbroken lines, except as otherwise indicated to conform to patterns.
 2. Form corners and chamfers with 3/4 inch x 3/4 inch strips, unless otherwise indicated, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer at changes in direction.
 - H. Unexposed corners may be formed either square or chamfered.
 - I. Ties and Spreaders: Arrange in a pattern acceptable to the Architect when exposed. Snap-ties may be used except at joints between pours where threaded internal disconnecting type shall be used.
 - J. Coordinate this section with other sections of work that require attachment of components to formwork.
 - K. Reglets and Rebates: Accurately locate, size, and form all reglets and rebates required to receive work of other trades, including flashing, frames, and equipment.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

- C. Do not allow excess form coating material to accumulate in the forms or to come into contact with reinforcement or surfaces which will be bonded to fresh concrete.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork will be rejected.
- E. Leave no residue or stain on the face of the concrete, nor affect bonding of subsequent finishes or work specified in other sections.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
 - 1. Provide openings in concrete formwork to accommodate work of other sections including those under separate contracts (if any). Size and location of openings, recesses and chases shall be in accordance with the section requiring such items. Accurately place and securely support items to be built into forms.
- B. Construction Joints: Construct and locate generally as indicated on Drawings and only at locations approved by Structural Engineer, so as not to impair the strength of the structure. Form keys in all cold joints shown or required.
- C. Locate and set in place items that will be cast directly into concrete.
- D. Rough Hardware and Miscellaneous Metal: Set inserts, sleeves, bolts, anchors, angles, and other items to be embedded in concrete. Set embedded bolts and sleeves for equipment to template and approved shop drawings prepared by trades supplying equipment.
- E. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- F. Wood Inserts and Nailers: Provide approved preservative-treated lumber. Set all required nailing blocks, grounds, and other inserts as required to produce results shown. Wood plugs shall not be used.
- G. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- H. Piping: Do not embed piping in structural concrete unless locations specifically approved by Structural Engineer.
- I. Conduit: Place conduit below slabs-on-grade and only as specifically detailed on structural drawings. Minimum clear distance between conduits shall be 3 diameters. Location shall be subject to Engineer's written approval and shall not impair the strength of the structure.
- J. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
 - 1. Provide openings for the introduction of vibrators at intervals necessary for proper placement.
 - 2. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

- K. Install Form Liner inserts in accordance with manufacturer's recommendations, to produce patterns and textures indicated.
- L. Install waterstops in accordance with manufacturer's recommendations to provide continuous waterproof barrier.

3.06 FORM CLEANING

- A. Clean forms as erection proceeds, remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
 - 1. Remove all dirt, chips, sawdust, rubbish, water and foreign materials detrimental to concrete.
 - 2. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.07 FOOTINGS

- A. Verify elevations and provide final excavation required for footings prior to placing of concrete.

3.08 EQUIPMENT BASES

- A. Form concrete bases for all mechanical and electrical equipment in accordance with approved shop details furnished by other sections.
- B. Sizes and locations as indicated and as required to produce results shown.
- C. Provide coved base for all equipment bases placed on concrete slabs.

3.09 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI SPEC-301.

3.10 FOAM BLOCK FORMWORK

- A. Blocks shall be placed on prepared leveling course for level bearing. Place adjacent blocks in tight contact together. Where placed in multiple layers, orient long axis of upper layer at 90° to lower layer, and so forth for subsequent layers. Anchor blocks as required to prevent movement prior to and during concrete placement. Do not expose to hydrocarbons, solvents, or coal tar.

3.11 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
- B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.
- C. Clean and repair surfaces to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.

- D. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

3.12 FORM REMOVAL

- A. Do not loosen or remove forms before minimum curing period has elapsed without employment of appropriate alternate curing methods, approved by the Architect in writing.
- B. Remove forms without damage to the concrete using means to ensure complete safety of the structure and without damage to exposed beams, columns, wall edges, chamfers and inserts. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Do not remove forms until the concrete has hardened sufficiently to permit safe removal and the concrete has attained sufficient strength to safely support imposed loads. The minimum elapsed time for removal of forms after concrete has been placed shall be as follows:
 - 1. Columns and Walls: 7 days, provided members are not subjected to overhead loads.
 - 2. Retaining Walls: 21 days minimum.
 - 3. Footings: 7 days minimum. If backfilled immediately, side forms may be removed 24 hours after concrete is placed.
 - 4. Beams, elevated slab, and similar overhead conditions: 28 days unless adequate shoring is provided.
- D. Durations listed above are minimums and are subject to extension at the sole judgment of the Architect/Engineer.
- E. Reshoring: Reshore members where and if required by Formwork Design Engineer.
- F. Do not subject concrete to superimposed loads (structure or construction) until it has attained full specified design strength, nor for a period of at least 14 days after placing.
- G. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

3.13 CLEANING

- A. Remove excess material and debris associated with this work from the job site.

END OF SECTION

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SECTION 03 20 00
CONCRETE REINFORCING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Reinforcing steel work for all concrete and masonry work as indicated on the drawings and specified herein.
 - 2. Coordinate this work with other work affected by these operations, such as forms, electrical work, mechanical work, structural steel, masonry and concrete.
- B. Related Sections:
 - 1. Pertinent Sections of Division 01 specifying Quality Control and Testing Laboratory services.
 - 2. Pertinent Sections of Divisions 03 specifying concrete construction.
 - 3. Pertinent Sections of Divisions 04 specifying masonry construction.
 - 4. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete work.

1.02 REFERENCE STANDARDS

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC) Chapter 19 Concrete.
- B. American Concrete Institute (ACI) SPEC-301 "Specifications for Concrete Construction".
- C. ACI CODE-318 "Building Code Requirements for Structural Concrete and Commentary".
- D. ACI MNL-066 "ACI Detailing Manual".
- E. ASTM International (ASTM) A1064 "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete".
- F. ASTM A615 "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement".
- G. ASTM A706 "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement".
- H. Concrete Reinforcing Steel Institute (CRSI) - "Manual of Standard Practice".
- I. CRSI - "Placing Reinforcing Bars".

1.03 SUBMITTALS

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. Submit for review prior to fabrication.

- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer.
- C. Shop Drawings: Show complete fabrication and placing details of all reinforcing steel. Comply with requirements of ACI MNL-66. Include:
 - 1. Bar sizes and schedules;
 - 2. Shapes of bent bars, layout and spacing of bars, location of splices.
 - 3. Stirrup spacing, arrangements and assemblies.
 - 4. References to Contract Document detail numbers and designations.
 - 5. Wall elevations corresponding to elevations shown in Contract Documents.
- D. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.
- E. Certificates: Submit all certifications of physical and chemical properties of steel for each heat number as manufactured, including location of material in structure as specified below in Article titled QUALITY ASSURANCE. All materials supplied shall be tagged with heat numbers matching submitted Mill Test Report analyses.
- F. Samples: Provide to the Owner's Testing laboratory as specified in Article SOURCE QUALITY CONTROL.

1.04 QUALITY ASSURANCE

- A. Perform work of this Section in accordance with the CRSI "Manual of Standard Practice", CRSI "Placing Reinforcing Bars", ACI SPEC-301, and ACI CODE-318.
- B. Requirements of Regulatory Agencies, refer to pertinent Sections of Division 01 and CBC.
- C. Certification and Identification of Materials and Uses: Provide Owner's Testing Agency with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection and all material identification/test information listed below.
 - 1. Provide manufacturer's Mill Test Reports for all materials. Include chemical and physical properties of the material for each heat number manufactured. Tag all fabricated materials with heat number.
 - 2. Provide letter certifying all materials supplied are from heat numbers covered by supplied mill certificates. Include in letter the physical location of each grade of reinforcing and/or heat number in the project (i.e. foundations, walls, etc.).
 - 3. Unidentified Material Tests: Where identification of materials by heat number to mill tests cannot be made, Owner's Testing Agency shall test unidentified materials as described below.
- D. Testing and Inspection: Tests and Inspections required by Independent Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY

CONTROL. Duties and limitations of Independent Testing Agency, test costs and test reports in conformance with pertinent Sections of Division 01.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent requirements of Division 01.
- B. Deliver reinforcement to project site in bundles marked with durable tags indicating heat number, mill, bar size and length, proposed location in the structure and other information corresponding with markings shown on placement diagrams.
- C. Handle and store materials above ground to prevent damage, contamination or accumulation of dirt or rust.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel: Deformed billet steel bars, ASTM A706 Grade 60 or ASTM A615 Grade 60.
 - 1. All reinforcement to be unfinished.
 - 2. ASTM A615 reinforcement at special structural concrete walls, concrete coupling beams, and special concrete moment frames shall have maximum yield stress of 78,000 psi and the tensile strength shall be greater than 125% of the actual yield strength. Test ASTM A615 reinforcement for conformance to these criteria prior to fabrication and/or installation.
- B. Tie Wire: No. 16 AWG or heavier, black annealed.
- C. Concrete Blocks: On-grade conditions only, as required to support reinforcing bars in position.
- D. Reinforcing Supports: Plastic or galvanized steel chairs, bolsters, bar supports, or spacers sized and shaped for adequate support of reinforcement and construction loads imposed during concrete placement, meeting ACI and CRSI standards.
 - 1. For use over formwork: Galvanized wire bar type supports complying with CRSI recommendations. Provide plastic tips where exposed to view or weather after removal of formwork. Do not use wood, brick, or other unacceptable materials.
- E. Reinforcement Splice Couplers: For use only where specified on drawings. Submit other locations proposed for use to Engineer for review. "L-Series Bar Lock" Coupler Systems for Splicing Reinforcement Bars, UES ER-0319, by Dayton-Superior Corporation.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4), unless specifically shown otherwise. Details not specifically shown or indicated shall conform to SP-066 and specified codes and standards.
 - 1. Accurately shop-fabricate to shapes, bends, sizes, gauges and lengths indicated or otherwise required.

2. Bend bars once only. Discard bars improperly bent due to fabricating or other errors and provide new material; do not re-bend or straighten unless specifically indicated. Rebending of reinforcement in the field is not allowed.
 3. Do not bend reinforcement in a manner that will injure or weaken the material or the embedding concrete.
 4. Do not heat reinforcement for bending. Heat-bent materials will be rejected.
- B. Unacceptable materials: Reinforcement with any of the following defects will not be permitted in the work.
1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
 2. Bends or kinks not indicated on Drawings or final shop drawings.
 3. Bars with reduced cross-section due to rusting or other cause.
- C. Tag reinforcement with durable identification to facilitate sorting and placing.
- D. Shop Fusion Welded Stirrup/Tie/Spiral Cages
1. Shop fusion welding of stirrup/tie/spiral cages is permitted to aid in fabrication and handling. The following requirements shall be met.
 2. All reinforcing bars receiving weld shall be ASTM A706.
 3. Longitudinal holding wires shall be ASTM A1064.
 4. Shop welding shall be performed by machines under a continuous, controlled process.
 5. Quality control tests shall be performed on shop-welded specimens and the test results shall be available, upon request, to the Architect/Engineer.
 6. Tack welding of reinforcing steel is not permitted.
 7. Welding of any type shall not occur at 90°, 135°, or 180° bends. Circular ties and spirals may be shop fusion welded outside of areas with 90°, 135°, or 180° hook bends.
 8. Longitudinal bars shall not be welded to stirrups/ties/spirals.

2.03 SOURCE QUALITY CONTROL

- A. The Testing Agency, as specified in the Article QUALITY ASSURANCE, will perform the following:
1. Material Testing:
 - a. Identified Steel: When samples are taken from bundled steel identified by heat number, matched with accompanying mill analyses as delivered from the mill, supplemental testing of reinforcing steel is not required.
 - b. Unidentified Steel: When identification of materials by heat number matched to accompanying mill analyses cannot be made, perform one tensile test and one bend test per each two and one-half tons or fraction thereof for each required size of reinforcing steel. Tests of unidentified

steel shall be performed by the Owner's Testing Agency and costs for these tests shall be paid by the Contractor by deductive change order.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Inspect the conditions under which concrete reinforcement is to be placed. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Coordinate with work of other sections to avoid conflicts or interference. Bring conflicts between reinforcement and other elements to Architect's attention. Resolve conflicts before concrete is placed.
- C. Notify Architect, Structural Engineer, and Authority Having Jurisdiction for review of steel placement not less than 48 hours before placing concrete.

3.02 PLACEMENT

- A. General: Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean bars free of substances which are detrimental to bonding. Maintain reinforcement clean until embedded in concrete.
- C. Place reinforcement to obtain the minimum coverages for concrete protection. Do not deviate from required position. Maintain required distance, spacing and clearance between bars, forms, and ground.
- D. Location and Support: Provide metal chairs, runners, bolsters, spacers and hangers, as required.
- E. Provide additional steel reinforcement as necessary or as directed, to act as spreaders or separators to maintain proper positioning.
- F. Tying and Attachment: Securely tie at all intersections and supports with wire. Prevent dislocation or movement during placement of concrete. Direct twisted ends of wire ties away from exposed concrete surfaces.
- G. Separate reinforcing from pipes or conduits with approved non-metallic separators. Do not use wood or steel form stakes or reinforcement used as stakes as support for reinforcement.
- H. Accommodate placement of formed openings required by other sections.
- I. Obstructions:
 - 1. Where obstructions, block-outs, or penetrations (conduits, raceways, ductwork) prevent continuous placement of reinforcement as indicated, provide additional reinforcing as detailed and as directed by the Structural Engineer to supplement the indicated reinforcement around the obstruction.
 - 2. Place additional trim bars, ties, stirrups, or other elements as detailed and as directed at all opening, sleeves, pipes or other penetrations through structural elements.

3.03 REINFORCING SPACING AND COVERAGE

- A. Spacing: Do not space bars closer than four (4) diameters of the largest of two adjacent bars, except at bar laps, which shall be placed such that a minimum of 2 bar diameters is clear between bars.
- B. Where reinforcing in members is placed in two layers, the distance between layers shall not be less than four bar diameters of the largest bar and the bars in the upper layers shall be placed directly above those in the bottom layer, unless otherwise detailed or dimensioned.
- C. Coverage of bars (including stirrups and columns ties) shall be as follows, unless otherwise shown:
 - 1. Concrete cast against earth or grade: 3 inches.
 - 2. Concrete exposed to weather or formed and exposed to earth:
 - a. #5 & smaller: 2-1/2 inches.
 - b. #6 & larger: 2-1/2 inches.
 - 3. Concrete not exposed to earth or weather:
 - a. #5 & smaller: 2-1/2 inch.
 - b. #6 & larger: 2-1/2 inches.

3.04 DOWELS, SPLICES, OFFSETS AND BENDS

- A. Provide standard reinforcement splices at splices, corners, and intersections by lapping ends, placing bars in contact, and tightly tying with wire at each end. Comply with details shown on structural drawings and requirements of ACI CODE-318.
- B. Provide minimum 1-1/2 inch clearance between sets of splices. Stagger splices in horizontal bars so that adjacent splices will be 4 feet apart.
- C. Splices of reinforcement shall not be made at points of maximum stress. Provide splice lengths as noted on the structural drawings, with sufficient lap to transfer the stress between bars by bond and shear.
- D. Spacing:
 - 1. Space bars minimum distance specified and all lapped bars 2 bar diameters (minimum) clear of the next bar.
 - 2. Stagger splices of adjacent bars where possible and where required to maintain bar clearance.
 - 3. Beam or slab top bars shall be spliced mid-span of column support and bottom bars spliced at column supports.
 - 4. Request Architect/Engineer review prior to placement for all splices not shown on the drawings.
- E. Reinforcement Couplers: Install at all locations indicated. Install couplers in accordance with manufacturer's recommendations.

3.05 WELDING

- A. No reinforcing shall be welded unless specifically indicated. No reinforcing shall be welded without prior approval of the Structural Engineer and the Authority Having Jurisdiction.
- B. Only when so approved for use as noted above, all welding shall conform to AWS D1.4, ACI CODE-318, and the following;
 - 1. All welding performed by certified welders.
 - 2. All reinforcement requires preheat prior to welding. All preheat and welding shall be continuously inspected by the Testing Agency.

3.06 MISPLACED REINFORCEMENT

- A. Notify Architect/Engineer immediately if reinforcing bars are known to be misplaced after concrete has been placed.
- B. Perform no correction or cutting without specific direction. Do not bend or kink misplaced bars.
- C. Correct misplaced reinforcing only as directed in writing by the Architect/Engineer. Bear all costs of redesign, new, or additional reinforcing required because of misplaced bars at Contractor's expense.

3.07 FIELD QUALITY CONTROL

- A. The Testing Agency as specified in the Article QUALITY ASSURANCE, will inspect the work for conformance to contract documents before concrete placement.
 - 1. Inspection: Provide inspection and verification of installed reinforcement. Confirm that the surface of the rebar is free of form release oil or other coatings.
 - 2. Inspect all preheat and welding activities for steel reinforcement, when these occur.
 - 3. Exception: Shallow foundations & non-structural slabs-on-grade supporting buildings of no greater than three stories and either of concrete design strength not greater than 2500psi or supporting light-frame construction do not require special inspection. Non-structural patios, driveways, and sidewalks do not require special inspection.

3.08 CLEANING

- A. Remove excess material and debris associated with this work from the job site.

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: Provide all labor, materials, equipment and services to complete all concrete work required, including, but not limited to, the following:
 - 1. Foundations, beams, columns, elevated slabs, slabs-on-ground, walls, and retaining walls.
 - 2. Installation of all bolts, inserts, sleeves, connections, etc. in the concrete.
 - 3. Joint devices associated with concrete work.
 - 4. Miscellaneous concrete elements, including, but not limited to: equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.
 - 5. Concrete curing.
 - 6. Coordination with other sections:
 - a. Make all preparations and do all work necessary to receive or adjoin other work. Install all bolts and anchors, including those furnished by other sections, into formwork and provide all required blocking.
 - b. Install all accessories embedded in the concrete and provide all holes, blockouts and similar provisions necessary for the work of other sections. Provide all patching or cutting made necessary by failure or delay in complying with this requirement at the Contractor's expense.
 - c. Coordinate with other sections for the accurate location of embedded accessories.
- B. Related Sections:
 - 1. Pertinent Sections of Division 01 specifying Quality Control and Testing Laboratory services.
 - 2. Pertinent Sections of Division 03 specifying concrete construction.
 - 3. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete.
 - 4. Pertinent sections of other Divisions specifying floor finishes and sealants applied to concrete substrates.

1.02 REFERENCES

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC) Chapter 19 Concrete.
- B. American Concrete Institute (ACI) PRC-211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete"
- C. ACI PRC-213 "Guide for Structural Lightweight-Aggregate Concrete".
- D. ACI SPEC-301 "Specifications for Concrete Construction".
- E. ACI PRC-302.1 "Guide for Concrete Floor and Slab Construction".
- F. ACI PRC-304 "Guide for Measuring, Mixing, Transporting, and Placing Concrete".
- G. ACI SPEC-305.1 "Specification for Hot Weather Concreting".
- H. ACI SPEC-306.1 "Standard Specification for Cold Weather Concreting".
- I. ACI SPEC-308.1 "Specification for Curing Concrete".
- J. ACI CODE-318 "Building Code Requirements for Structural Concrete and Commentary".

1.03 SUBMITTALS

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review. Submit for review prior to fabrication.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.
- C. Product Data: Submit manufacturers' data on manufactured products and other concrete related materials such as bond breakers, cure/sealer, admixtures, etc. Demonstrate compliance with specified characteristics. Provide samples of items upon request.
- D. Mix Designs: Submit Mix Designs for each structural concrete type required for work per requirements of articles CONCRETE MIXES and QUALITY ASSURANCE. Resubmit revised designs for review if original designs are adjusted or changed for any reason. Non-Structural mixes need not be submitted for review by Structural Engineer.
- E. Shop Drawings: Proposed location of construction and cold joints. Proposed location of all slab construction/dowel joints, control joints, and blockouts.
- F. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.
- G. Batch Plant Ticket: Include with delivery of each load of concrete. Provide ticket to the Testing Agency and the Architect/Engineer as separate submittals. Concrete delivered to

the site without such ticket shall be rejected and returned to the plant. Each ticket shall include all information specified in Article SOURCE QUALITY CONTROL below.

- H. Engineering Analysis: Prepared by a California-licensed Civil or Structural Engineer, justifying construction-imposed loads on slabs, beams, and walls which exceed those allowed by CBC for the specified use.
 - 1. 2000 lbs maximum allowable construction load without analysis.
 - 2. 10,000 lbs maximum allowable construction load with analysis.
- I. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.04 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- B. Concrete construction verification and inspection to conform to CBC 1705.3.
- C. Common Sourcing: Provide each of the following materials from consistent sources for entire project.
 - 1. Cement.
 - 2. Fly ash.
 - 3. Aggregate.
 - 4. Slag Cement.
- D. Follow requirements of ACI SPEC-305.1 when concreting during hot weather. Follow requirements of ACI SPEC-306.1 when concreting during cold weather.
- E. Services by the Independent Testing Agency (includes "Special" Inspections) as specified in this Section and as follows:
 - 1. Perform tests and inspections specified below in articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and reports to be in conformance with pertinent Sections of Division 01.
- F. Contractor shall bear the entire cost of remediation, removal, and/or replacement of concrete determined defective or non-conforming, including Architect/Engineer fees for redesign.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Materials specified by brand name shall be delivered in unbroken packages bearing manufacturer's label and shall be brand specified or an approved equal.

- B. Delivery, Handling and Storage of other materials shall conform to the applicable sections of the current editions of the various reference standards listed in this Section.
- C. Protect materials from weather or other damage. Sort to prevent inclusion of foreign materials.
- D. Specific Requirements:
 - 1. Cement: Protect against dampness, contamination, and warehouse set. Store in weather tight enclosures.
 - 2. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregates. Use only one supply source for each aggregate stock pile.
 - 3. Admixtures:
 - a. Store to prevent contamination, evaporation, or damage.
 - b. Protect liquid admixtures from freezing and extreme temperature ranges.
 - c. Agitate emulsions prior to use.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather (Freezing or near-freezing temperatures) per ACI SPEC-306.1:
 - 1. Heat concrete materials before mixing, as necessary to deposit concrete at a temperature of at least 50°F but not more than 90°F.
 - 2. Do not place concrete during freezing, near-freezing weather, snow, rain or sleet unless protection from moisture and/or cold is provided.
 - 3. Protect from freezing and maintain at a temperature of at least 50°F for not less than seven days after placing. Take special precautions to protect transit-mixed concrete.
 - 4. No salts, chemical protection or admixture are permitted without written approval of Architect/Engineer.
 - 5. Contractor shall maintain an air temperature log for the first 7 days after placement with entry intervals not to exceed 8 hours.
- B. Hot Weather per ACI SPEC-305.1:
 - 1. Cool concrete materials before mixing, or add ice in lieu of mix water as necessary to deposit concrete at a temperature below 85°F.
 - 2. Do not place concrete in hot/windy weather without Architect/ Engineer review of procedures.
 - 3. Provide sunshades and/or wind breakers to protect concrete during finishing and immediate curing operations. Do not place slab concrete at air temperature exceeding 90°F.

4. Provide modified mix designs, adding retarders to improve initial set times and applying evaporation reducers during hot/windy weather for review by Independent Testing Agency prior to use.

1.07 SCHEDULING AND SEQUENCING

- A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the Testing Agency.
- B. Provide schedule and sequence information to Testing Agency in writing upon request. Update information as work progresses.

PART 2 – PRODUCTS

2.1 FORMWORK

- A. Comply with requirements of Section 03 1000.

2.2 REINFORCEMENT

- A. Comply with requirements of Section 03 2000.

2.3 MATERIALS

- A. General Requirements: All materials shall be new and best of their class or kind. All materials found defective, unsuitable, or not as specified, will be condemned and promptly removed from the premises.
- B. Cementitious Materials:
 1. Portland Cement: ASTM C150, Type II, low alkali conforming to CBC 1903.1.
 2. Fly Ash (Pozzolan): ASTM C618, Class F.
 - a. Available alkali as $\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$ must not exceed 1.5 percent when tested under ASTM C311, or
 - b. Total alkali as $\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$ must not exceed 5.0 percent when tested under AASHTO T105.
 3. Slag Cement: ASTM C989, Grade 100 or 120.
- C. Concrete Aggregates:
 1. Coarse and Fine Aggregates: ASTM C33; Stone aggregate and sand. Specific source aggregate and/or sand or shrinkage characteristics as required for class of concrete specified.

2. Source shall remain constant throughout the duration of the job. The exact portions of the fine aggregates and coarse aggregates to be used in the mix shall be determined by the mix design.
 3. Recycled concrete products: Returned plastic concrete may not be used in a mix. Recycled Concrete Aggregate (RCA) is not permitted. Reclaimed coarse aggregate is permitted and shall comply with ASTM C33. Reclaimed fine aggregate is not permitted.
 4. Aggregates shall be tested for alkali reactivity per CBC section 1903A.5. Where test results exceed allowable limits, additional testing of mitigation procedures shall be provided, as outlined per CBC section 1903A.5.
 5. Both fine and coarse aggregates shall contain a maximum of 100 mg/kg (ppm) of water-soluble chloride ions and water-soluble sulfate ions. pH shall be between 6.5 and 8.0.
- D. Water: ASTM C1602. Potable, clean, from domestic source. Non-potable water shall not be used without the approval of the Architect/Engineer. Maximum of 100 mg/kg (ppm) of water-soluble chloride ions and water-soluble sulfate ions. PH shall be between 6.5 and 8.0.
- E. Admixtures: All admixtures shall be used in strict accordance with the manufacturer's recommendations. Admixtures containing calcium chlorides or other accelerators shall not be used without the approval of the Architect/Engineer and the Owner's Testing Laboratory.
1. Normal or Mid Range Water Reducing Admixtures: ASTM C494 Type A, "MasterPozzolith" series or "MasterPolyheed" series by Master Builders Solutions, "WRDA" series by W.R. Grace, or equal.
 2. Water Reducing Admixture and Retarder: ASTM C494 Type B or D, "MasterSet R" series or "MasterSet DELVO" series by Master Builders Solutions, "PlastiflowR" by Nox-crete, or equal.
 3. High Range Water-Reducing Admixtures: ASTM C494 Type F, "MasterRheoBuild 1000" or "MasterGlenium" series by Master Builders Solutions or equal.
 4. Air Entraining Admixtures: ASTM C260, "MasterAir" series by Master Builders Solutions or equal.
 5. Viscosity Modifiers: ASTM C494 Type S, "MasterMatrix VMA" series by Master Builders Solutions or equal..
- F. Slurry: Same proportion of cement to fine aggregates used in the regular concrete mix (i.e. only coarse aggregate omitted); well mixed with water to produce a thick consistency.
- G. High Strength Grout: See section 05 1200 or 05 1100 for requirements.
- H. Dry Pack: Dry pack (used only for cosmetic concrete repairs) shall consist of:

1. One part cement to 2-1/2 parts fine aggregate (screen out all materials retained on No.4 sieve), mixed with a minimum amount of water, added in small amounts.
2. Mix to consistency such that a ball of the mixture compressed in the hand will retain its shape, showing finger marks, but without showing any surface water.

2.4 ACCESSORIES

- A. Bonding Agent: ASTM C881, Type II Grade 2 Class B or C. Do not allow epoxy to set before placing fresh concrete.
1. "MasterEmaco ADH 326" by Master Builders Solutions;
 2. "Rezi-Weld 1000" by W.R. Meadows.
- B. Chemical Hardener: Fluorosilicate solution designed for densification of cured concrete slabs. "MasterKure HD 300 WB" by Master Builders Solutions, "LIQUI-HARD" W.R. Meadows Co, or equal.
- C. Moisture-Retaining Cover: ASTM C171, type 1, one of the following;
1. Regular Curing Paper, Type I, reinforced waterproof: Fortifiber Corporation "Orange Label Sisalkraft", "Pabcotite" paper, or equal.
 2. Polyethylene Film: ASTM D 2103, 4 mil thick, clear or white color.
 3. White-burlap-polyethylene sheet, weighing not less than 10 oz/per linear yd.
- D. Liquid Curing Compound: ASTM C 309, Type 1, Class B, clear or translucent, 25% minimum solids, water base acrylic cure/sealer which will not discolor concrete and compatible with bonding of finishes specified in related sections. W.R. Meadows Co. "Vocomp 25" or equal. Maximum VOC content shall comply with local requirements and California Green Building Code.
- E. Under Slab Water Vapor Retarder: Vapor retarder sheet to be ASTM E1745 Class A; 15 mil, single ply extruded polyolefin; permeance no greater than 0.01 U.S. Perms per ASTM E154, ASTM E96 procedure B or ASTM F1249.
1. "Stego Wrap Vapor Barrier (15mil)" by Stego Industries LLC.
 2. "Vaporguard" by Reef Industries.
 3. Approved Equal.
- F. Evaporation Reducer: "MasterKure ER 50", by Master Builders Solutions.

2.5 JOINT DEVICES AND MATERIALS

- A. Expansion Joint Filler: ASTM D1751, Nonextruding, resilient asphalt impregnated fiberboard or felt, 3/8 inch thick and 4 inches deep; tongue and groove profile.

1. Products: "Serviced Products", W.R. Meadows, Inc., "National Expansion Joint Company", "Celotex Corporation", or equal.
- B. Joint Filler: ASTM D944, Compressible asphalt mastic with felt facers, 1/4 inch thick and 4 inches deep.
- C. Sealant and Primer: As specified in Section 07 9000.
- D. Slab Joint Sealant: Compatible with floor finishes specified in related sections.

2.6 CONCRETE MIXES

- A. General requirements for mix design and submittal of structural class concrete:
 1. Provide Contractor submittals to Architect/Engineer not less than 15 days before placing concrete.
 2. Contractor shall review mix designs and proposed placing requirements prior to submittal for compatibility to ensure that the concrete as designed can be placed in accordance with the drawings and specifications.
 3. Changes or revisions require re-submittal: All variations to approved mix designs, including changing type and/or quantity of admixtures shall be resubmitted to the Architect/Engineer for review prior to use.
 4. Mix design(s) for all structural classes of concrete to be prepared by qualified person experienced in mix design. Allow for time necessary to do trial batch testing when required.
 5. Preparer to provide backup data and certify in writing that mix design meets:
 - a. Requirements of the specifications for concrete durability and quality;
 - b. Requirements of the California Building Code and ACI CODE-318, including break histories, trial batching test results, and/or a mix designed by a California Registered Civil Engineer per ACI CODE-318 and bearing the Engineer's seal & signature.
 6. Clearly note on mix designs with specified maximum W/CM if design permits addition of water on site, or clearly identify in the mix design that no water is to be added on site.
 7. Deviations: Clearly indicate proposed deviations, and provide written explanation explaining how the deviating mix design(s) will provide equivalent or better concrete product(s) than those specified.
 8. Include adjustments to reviewed mix designs to account for weather conditions and similar factors.
 9. Demonstrate maximum water-soluble chloride ions (Cl⁻) content in concrete (percent by mass of cementitious materials) does not exceed 0.15% by either:

- a. Calculating total chloride ion content of the concrete mixture on the basis of measured total chloride ion content from concrete materials and concrete mixture proportions.
 - b. Determine water-soluble chloride ion content of hardened concrete in accordance with ASTM C1218 at age between 28 and 42 days.
- B. Proportioning - General: The following provisions apply to all mix designs:
 - 1. Proportion concrete mixes to produce concrete of required average strength (as defined by ACI CODE-318). Select slump, aggregate sizes, shrinkage, and consistency that will allow thorough compaction without excessive puddling, spading, or vibration, and without permitting the materials to segregate, or allow free water to collect on the surface.
 - 2. Select aggregate size and type to produce dense, uniform concrete with low to moderate shrinkage, free from rock pockets, honeycomb and other irregularities.
 - 3. Mix designs may include water reducing and retarding admixtures to meet or exceed minimum set times (time required to place and finish) and to minimize Water-Cementitious Materials (W/CM). Minimum and maximum criteria presented in this section are guidelines and do not represent a specific mix design.
 - 4. Cement Content: Minimum cement content indicates minimum sacks of cementitious material. Increasing cement content to increase early strengths or to achieve specified W/CM while maintaining water content is discouraged in order to minimize effects of shrinkage.
 - a. Substitution of fly ash for Portland cement on an equivalent weight basis up to 25% replacement is permitted, except at high early strength concrete. Replacement in excess of 25% is not permitted unless part of a specified mix design that has been submitted for review.
 - b. Substitution of slag cement for Portland cement on an equivalent weight basis up to 45% replacement is permitted, except at high early strength concrete. Replacement in excess of 45% is not permitted unless part of a specified mix design that has been submitted for review.
 - c. Such substitution requests may be denied by the Engineer.
 - 5. Water Content: Mix designs with a specified maximum W/CM may be designed with a lower WCR than specified in order to allow addition of water at the site.
 - 6. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301 and this section.
 - a. For trial mixtures method, employ independent testing agency acceptable to Architect/Engineer for preparing and reporting proposed mix designs.
 - 7. Placement Options: Mix designs may, at the Contractor's option, be designed for either pump or conventional placement with aggregate size, slumps, etc. to be maintained as specified in this section.

8. Provide permeability reducing admixture in all structural concrete mixes. Dosage per manufacturer.
 9. If relevant historical data is not available, mix(es) shall be trial batched to verify mechanical and chemical properties. Mechanical property testing shall include 28 day compressive strength, flowability, and setting time. Chemical testing shall occur no sooner than 7 days after casting sample(s). At least (1) sample shall be tested for chemical properties from each mix design. Chemical testing shall include:
 - a. Water-soluble chlorides tested per ASTM C1218 shall be less than 0.3% by weight of cement.
 - b. pH tested per California Test 643 shall be higher than pH 10.0.
 - c. The chemical composition, relevant to the durability of concrete (i.e. chlorides, sulfates, and pH), of admixtures shall be provided for review.
- C. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations and this section.
- D. Special mix design requirements for interior concrete floor slabs-on-ground:
1. Proportion concrete mixes per this specification, ACI PRC-211.1, and the requirements below:
 2. Fly Ash, shall be substituted for cement on a 1 lb. per 1 lb. basis, with a minimum replacement of 25% and a maximum of 35%. Alternatively, slag cement, shall be substituted for cement on a 1 lb. per 1 lb. basis, with a minimum replacement of 30% and a maximum of 45%.
 3. Reduce total sand to minimum practical.
 4. Admixture dosage shall be per manufacturer's recommendations. Dosage may be increased for workability as long as set times are not excessive for placement and finishing.
- E. Mix Design Minimum Requirements:

Concrete Class	Coarse Aggregate Size (Inches) & Fine Aggregate ³	Maximum W/CM or Maximum Nominal Slump & Tolerance (Inches) ^{1,2}	Minimum 28-Day Design Strength	Minimum Cement Sacks/per yd ⁴
NON-STRUCTURAL				
1) Lean Concrete (use only where specified)	---	---	---	3.0
2) Exterior Slab on Ground (Walkways & Patios)	1" x #4	W/CM = .40	5,000	4.5
STRUCTURAL				

3) Interior Slab on Ground ⁵	1" x #4	W/CM = .40	5,000	6.1
4) Foundation (including continuous footings, pad footings, grade beams, stem walls)	1" x #4	W/CM = .40	5,000	5.0
5) Walls	1" x #4	W/CM = 0.46	5,000	6.0

1. The tolerance is the maximum deviation allowable without rejection. The mix design shall be based on the nominal value specified and is without water reducing mixtures. Slump to be measured at the end of the hose.
2. The maximum W/CM is limited at time of placement as noted. No water is to be added on site such that the specified W/CM or maximum slump is exceeded without approval of the testing laboratory and the Architect/Engineer. Workability is to be achieved utilizing an acceptable mid range to high range water reducing admixture.
3. Gradation of aggregate is per ACI CODE-318 and ASTM C33.
4. Minimum cement content includes all cementitious materials.
5. See Article 2.6E for additional requirements at interior slabs on ground.

2.7 MIXING CONCRETE

- A. Batch final proportions in accordance with approved mix designs. All adjustments to approved proportions, for whatever reason, shall be reviewed by the Architect/Engineer prior to use.
- B. Batch and mix concrete in accordance with ASTM C94, at an established plant. Site mixed concrete will be rejected.
- C. Provide batch and transit equipment adequate for the work. Operate as necessary to provide concrete complying with specified requirements.
- D. Place mixed concrete in forms within 1-1/2 hours from the time of introduction of cement and water into mixer or 300 revolutions of the drum whichever comes first. Use of, remixing, and/or tempering mixed concrete older than 1 hour will not be permitted.
- E. Do not add water at the site to concrete mixes with a maximum specified W/CM unless the water content at batch time provides for a W/CM less than specified and this provision, including the quantity of water which may be added at the site, is specifically noted on the mix design and certification by the mix preparer. See ASTM C94 for additional requirements.

2.8 SOURCE QUALITY CONTROL

A. Services by independent Testing Agency:

1. Where aggregate alkali reactivity testing (and, when applicable, mitigation testing) per the MATERIALS section is not available, the Testing Agency shall perform this testing to verify materials conformance to CBC section 1903A.5.
2. Batch Plant inspection at automated plants to occur at commencement of concrete work each day (first truck). Batch Plant inspection at non-automated plants and when accuracy is questionable shall be continuous. Additionally, water cement ratio (WCR) is to be verified where a WCR is specified herein. The computed WCR is to be written on the Batch Plant Certificate to be taken to the job site prior to the truck leaving the plant. See requirements of CBC 1705A.3.3.
3. Batch Plant Certificates: Obtain the weighmaster's Batch Plant Certificate at arrival of truck at the site. If no batch plant certificate is provided, recommend to the General Contractor that the truckload of concrete be rejected. So note in daily log, along with the location of the load of concrete in the structure if the load is not rejected.
 - a. Laboratory's inspector shall obtain for each transit mixer Batch Plant Certificates to verify mix design quantities and condition upon delivery to the site.
 - b. Certificates to include: Date, time, ingredient quantities, water added at plant and on job, total mixer revolutions at time of placement, and time of departure.
 - c. Concrete with specified water cement ratio: Add no water on site unless mix design and batch records each show additional water may be added. See ASTM C94 for additional requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
- B. Verify work of other sections is complete and tested as required before proceeding.

3.02 PREPARATION

- A. Observation, Inspection and Testing:
 1. Architect/Engineer: Notify not less than 2 working days before each concrete placement, for observation and review of reinforcing, forms, and other work prior to placement of concrete.
 2. Testing Agency: Notify not less than 24 hours before each placement for inspection and testing.
- B. Placement Records: Contractor shall maintain records of time, temperature and date of concrete placement including mix design and location in the structure. Retain records

until completion of the contract. Make available for review by Testing Agency and Architect/Engineer.

- C. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.
- D. Verify location, position and inclusion of all embedded and concealed items.
- E. Verify installation of vapor retarder under interior slabs on ground, as specified in related section, is complete.
- F. Cleaning and Preparation:
 - 1. Remove loose dirt, mud, standing water, and foreign matter from excavations and cavities.
 - 2. Close cleanout and inspection ports securely.
 - 3. Thoroughly clean reinforcement and other embedded items free from loose rust and foreign matter. Maintain reinforcing securely in place. Do not place concrete on hot reinforcing.
 - 4. At cold joints, remove laitance from previously placed concrete surface.
 - 5. Dampen form materials and substrates on which concrete is to be placed at least 1 hour in advance of placing concrete; repeat wetting as necessary to keep surfaces damp. Do not saturate. Do not place concrete on saturated material.
 - a. Thoroughly wet wood forms (except coated plywood), bottom and sides of trenches, adjacent concrete or masonry and reinforcement.
 - b. Concrete slabs on base rock, dampen rock.
 - c. Concrete slabs on vapor retarder, do not wet vapor retarder.
 - 6. Verify that metal forms are clean and free of rust before applying release agent.
 - 7. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

3.03 PIPES AND CONDUITS IN CONCRETE

- A. Slabs-on-Ground:
 - 1. No pipe or conduit exceeding 1 inch outside diameter shall be embedded within the specified slab thickness except as specifically detailed.
 - 2. Do not stack or abut pipes, maintain 3 inches minimum clearance.
- B. Sleeving and Wrapping:
 - 1. Foundations: Sleeve or wrap all individual pipe penetrations, minimum 1-1/2 inches clear to reinforcing all around.

- a. Sleeves: PVC. Provide 1 inch minimum clear all around O.D. pipe to I.D sleeve, UNO at ends, fill void space with mastic or plastic bituminous cement.
 - b. Wrapped Vertical Pipes: Provide 1/8 inch nominal sheet foam with three wraps minimum, UNO.
 - c. Wrapped Horizontal Pipes: Provide 1/8 inch nominal sheet foam with eight wraps minimum, UNO.
 - d. Underground Fire Lines 4" and Larger: At sleeves provide 2 inch minimum clear all around O.D. pipe to I.D sleeve. At wrapped pipes, provide 1/8 inch nominal sheet foam with sixteen wraps minimum.
- 2. Slabs or Curbs: Wrap pipes as described above.
- C. Space groups of pipes/conduits at least 3 sleeve diameters apart, do not interrupt specified concrete and reinforcement.
 - 1. Provide block-outs as detailed when grouping of pipes/conduits in foundation or other structural member prevents spacing as described. Notify Architect/Engineer for review of any conditions not conforming to details.
 - 2. Center pipe/conduit penetrations in the depth and/or thickness of foundations.
 - 3. Maximum size of pipe/conduit penetrations shall not exceed the least dimension of concrete divided by 3.

3.04 CONCRETE PLACEMENT

- A. Transporting:
 - 1. Provide clean, well-maintained equipment of sufficient quantity and capacity to execute the work and produce concrete of quality specified.
 - 2. Handle and transport concrete from mixer to final deposit location as rapidly as practicable. Prevent separation or loss of ingredients.
- B. Perform concrete placement by methods which will not puncture, damage or disturb vapor retarder membrane. Repair all damage to vapor retarder membrane before covering.
- C. Placement - General: Placement, once started, shall be carried on as a continuous operation until section of approved size and shape is completed. Provide construction joints as detailed on the drawings. Engineer's written approval required for all deviations.
 - 1. Deposition:
 - a. Deposit concrete to maintain an approximately horizontal plastic surface until the completion of the unit placement.
 - b. Deposit as neatly as practicable in final position, minimize re-handling or flow.

- c. Do not drop concrete freely where reinforcing bars, embeds, or obstructions occur that may cause segregation. Provide spouts, elephant trunks, or other means to prevent segregation during placement.
- 2. Progress Cleaning: Remove all concrete spilled on forms or reinforcing steel in portions of structure not immediately concreted. Remove completely before concrete sets.
- 3. Interruptions: Shut down placement operations and dispose of all remaining mixed concrete and concrete in hoppers or mixers following all interruption in placement longer than 60 minutes.
 - a. If such interruption occurs, provide new or relocate existing construction joints as directed by Engineer.
 - b. Cut concrete back to the designated line, cleaning forms and reinforcing as herein specified.
 - c. Prepare for resumption of placement as for new unit when reason for interruption is resolved.

D. Consolidation:

- 1. Consolidate all concrete thoroughly during placement with high-speed mechanical vibrators and other suitable tools. Perform manual spading and tamping to work around reinforcement, embedded fixtures, and into corners of formwork as required to obtain thorough compaction.
 - a. Provide vibrators with sufficient amplitude for adequate consolidation.
 - b. Use mechanical vibrators at each point of concrete placement.
 - c. Keep additional spare vibrators, in addition to those required for use, at the site for standby service in case of equipment failure.
- 2. Consolidate each layer of concrete as placed.
 - a. Insert vibrators vertically at points 18 to 30 inches apart; work into top area of previously placed layer to reconsolidate, slowly withdraw vibrator to surface.
 - b. Avoid contact of vibrator heads with formwork surfaces.
 - c. Systematically double back and reconsolidate wherever possible. Consolidate as required to provide concrete of maximum density with minimized honeycomb.

E. Unacceptable Materials:

- 1. Do not place concrete that has started to set or stiffen. Dispose of these materials.
- 2. Do not add water on site to concrete except as specified in the approved mix design, see PART 2 above.

F. Protection of installed work:

1. Do not introduce any foreign material into any specified drainage, piping or duct systems.
2. Contractor shall bear all costs of work required to repair or clean affected work as a result of failure to comply with this requirement.

3.05 CONCRETE JOINTS

A. Structural Joints (Construction/Cold Joints):

1. Locate joints only where shown, or as approved.
2. Review Required: Joints not indicated on the plans shall be located to meet the minimum requirements below, shall not impair the strength of the structure and shall be submitted to Architect/Engineer for review prior to placement of concrete.
 - a. Indicate proposed location(s) of construction/cold/expansion joints on shop drawing submittals for review prior to placing concrete.
3. Clean and roughen all surfaces of previously placed concrete at construction joints by washing and sandblasting to expose aggregate to 1/4 inch amplitude.
4. Slabs-On-Ground: Maximum Length of continuous placement shall not exceed 60 feet without special review by the Architect/Engineer. Alternate or stagger placement sections.
5. Foundations, Beams, Elevated Slabs and Joists: Maximum Length of continuous placement shall not exceed 200 foot increments. Provide "keyed" shut-off locations made up with form boards. Extend reinforcing one lap length or more through shut-off.
 - a. All reinforcement shall be continuous through construction/cold joint, lapping to adjacent reinforcing in future placement.
 - b. Construction Joints in Elevated Slabs: Review all proposed locations with Architect/Engineer.
 - c. Construction Joints in Slabs on Metal Decking: Review all proposed locations with Architect/Engineer. Do not locate closer than 48 inches of centerline of beam.
6. Retaining and Basement Walls: Maximum Length of continuous placement shall not exceed 100 foot increments. Provide "keyed" shut-off locations made up with form boards to limit the length of continuous placement and at abrupt changes in wall thickness. Extend reinforcing one lap length or more through shut-off.
 - a. Review all proposed locations with Architect/Engineer
 - b. Horizontal construction joints are not allowed unless approved by the Engineer

B. Expansion/Construction Joints (Dowel Joints and Control Joints):

1. Interior and Exterior Slabs-on-Ground:
 - a. Expansion/Construction Joints: Provide dowel joints or control joints at a maximum dimension (in feet) of three times the slab thickness (in inches)

in each direction unless noted otherwise (15'-0" maximum). Install joints to match slab level and in straight lines. Locate joints at all reentrant corners including blockouts.

- b. Proportions: Install joints to divide slab into rectangular areas with long dimensions less than 1.5 times short dimension.

2. Exterior Concrete Slabs-on-Ground (walkways, patios):

- a. Expansion/ construction joints: Provide a 2 inch deep troweled groove or asphalt impregnated joint material embedded 50 percent of the slab depth at 12 feet on center, maximum.
- b. Proportions: Place no section with a length larger than two times width. Additionally, place joints at all inside corners and at all intersections with other work.

3. Retaining and Site Walls:

- a. Contraction Joints: Provide ¾ inch wide beveled wood strips attached to inside face of formwork on each side of the wall. Wood strips shall extend 1/8 times the wall thickness into the wall. Cut 50% of the horizontal reinforcing bars at contraction joint locations
- b. Proportions: Place joints at 2 times the height of the wall on center max, but not less than 10'-0". Joints shall not exceed 25'-0" on center.
- c. Review all proposed locations with Architect/Engineer

C. Joint Types:

- 1. Dowel Joint: A keyed joint with smooth dowels passing through to allow unrestricted movement due to contraction and expansion. Joints are as specified on the drawings.
- 2. Control Joint(s): Shrinkage crack control joints may be of the following types when shown on the drawings. Install joints in a straight line between end points with edges finished appropriate to type. Depth shall be 25% of the slab thickness, unless noted otherwise. Fill joints with sealant as shown on the drawings or as required by related sections.
 - a. 1/4 inch wide troweled joint.
 - b. Keyed joint: Only at locations where concealed by other finishes.
 - c. Masonite Strip, 1/8 inch: Only at locations where concealed by other finishes.
 - d. Saw Cut, 1/8 inch: Must be performed within eight hours of completion of finishing. Do not make saw cuts if aggregate separates from cement paste during cutting operation. Prevent marring of surface finish. Fill with flexible sealant.

3.06 VAPOR RETARDER

- A. Vapor Retarder Installation: Install as specified in PART 2, ASTM E1643, and per manufacturer's recommendations including taping and lapping of seams, sealing of penetrations, and repair of damage. Do not extend vapor retarder below footings.

3.07 FLATWORK

- A. General Requirements for All Concrete Formed & Finished Flat:

1. Edge Forms and Screeds: Set accurately to produce indicated design elevations and contours in the finished surface, edge forms sufficiently strong to support screed type proposed.
 2. Jointing: Located and detailed as indicated.
 3. Consolidation: Concrete in slabs shall be thoroughly consolidated.
- B. Flatwork Schedule:
1. Exterior Slabs-On- Ground: Place concrete directly over sub-base as indicated.
 - a. Sub-Base: Clean free-draining, crushed base rock, 4 inch minimum thickness, thoroughly compacted.
 2. Interior Concrete Slabs-On- Ground:
 - a. Sub-Base: Clean free-draining, crushed base rock, 4 inch minimum thickness, thoroughly compacted.
 - b. Vapor Retarder: Install over sub-base.

3.08 FORMED SURFACES

- A. Form all concrete members level and plumb, except as specifically indicated. Comply with tolerances specified in ACI CODE-318, ACI SPEC-301, and this specification, except that maximum permissible deviation is 1/4 inch end-to-end for any single member.
- B. Cambers: Provide all cambers indicated in the formwork construction. Set screeds to produce specified cambers in the finished concrete.

3.09 CONCRETE FINISHES

- A. Flatwork Finishing:
1. All exposed concrete flatwork surfaces shall be non-slip. See Architectural, Civil, and Landscape drawings.
 2. Perform with experienced operators.
 3. Finish surfaces monolithically. Establish uniform slopes or level grades as indicated. Maintain full design thickness.
 4. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on drawings.
 5. Flatwork Finish Types:
 - a. Wood Float Finish: Surfaces to receive quarry tile, ceramic tile, or cementitious terrazzo with full bed setting system, or wood frame for raised finished floors.
 - b. Steel Trowel Finish: Surfaces to receive carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set tile or similar finishes specified in related sections. Trowel twice, minimum.

- c. Broom Texture Finish: Exterior surfaces as indicated or for which no other finish is indicated. Finish as for steel trowel finish, except immediately following first troweling, (depending on conditions of concrete and nature of finish required) provide uniform surfaces texture using a medium or coarse fiber broom.
- B. Other Concrete: Provide as required to achieve appearance indicated on structural and architectural drawings and related sections.
 - 1. Repair surface defects, including tie holes, immediately after removing formwork.
 - 2. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
 - 3. Exposed Form Finish: Finish concrete to match forms. Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 - a. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
 - b. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
 - c. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.
 - 4. Intermediate joint and score marks and edges: Tool smooth and flush unless otherwise indicated or as directed by the Architect.
 - 5. Use steel tools of standard patterns and as required to achieve details shown or specified. All exposed corners not specified to be chamfered shall have radiused edges.

3.02 TOLERANCES

- A. Minimum Flatwork Tolerances: Measure flatness of slabs within 48 hours after slab installation in accordance with ACI PRC-302.1 and ASTM E1155 and to achieve the following FF and FL tolerances:
 - 1. Exterior surfaces: 1/8 inch minimum per foot where sloped to drain. Level otherwise. FF20 and FL15.
 - 2. Interior surfaces not otherwise shown or required: Level throughout. FF25 and FL20
 - 3. Interior surfaces required to be sloped for drainage: 1/8 inch in 10 ft.
 - 4. Finish concrete to achieve the following tolerances:
 - a. Under Glazed Tile on Setting Bed: FF30 and FL20.
 - b. Under Resilient Finishes: FF35 and FL25.
 - c. Flooring manufacturer and pertinent section of Division 9.

B. Formed Surface Tolerances:

1. Permanently Exposed Joints and Surfaces: Provide maximum differential height within two feet of, and across construction joints of 1/16 inch.
2. Vertical Elevations: Elevation of surfaces shall be as shown or approved.

3.03 CONCRETE CURING

- A. Curing - General: Cure in accordance with ACI SPEC-308.1. Maintain concrete water content for proper hydration and minimize temperature variations. Begin curing immediately following finishing.
- B. Protection During Curing: Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. The General Contractor is responsible for the protection of the finished slab from damage.
1. Avoid foot traffic on concrete for minimum of 24-hours after placement.
 2. Protect concrete from sun and rain.
 3. Maintain concrete temperature at or above 50 degrees F. during the first 7 days after placement. See Article ENVIRONMENTAL REQUIREMENTS.
 4. Do not subject concrete to design loads until concrete is completely cured, and until concrete has attained its full specified 28-day compressive strength or until 14 days after placement, whichever is longer.
 5. Protect concrete during and after curing from damage during subsequent building construction operations. See Article PROTECTION.
- C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
1. Normal concrete: Not less than 7 days.
- D. Begin curing immediately following finishing.
- E. Surfaces Not in Contact with Forms:
1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than 3 days by water ponding, watersaturated sand, water-fog spray, or saturated burlap.
 2. Begin final curing after initial curing but before surface is dry.
 - a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.
 - b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3. In addition, see specific conditions noted below.
- F. Slabs on Ground: Cure by one of the following methods:
1. Water Cure (Ponding): Maintain 100 percent coverage of water over floor slab areas, continuously for minimum 7 calendar days.
 2. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
 3. Moisture-Retaining Film or Paper: Lap strips not less than 6 inches and seal with waterproof tape or adhesive; extend beyond slab or paving perimeters minimum 6 inches and secure at edges; maintain in place for minimum 7 days.
 4. Absorptive Moisture-Retaining Covering: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides and extend beyond slab or paving perimeters 6 inches minimum; maintain in place for minimum 7 days.
 5. Liquid Membrane-forming Curing Compound: Provide only when subsequent concrete treatments or finish flooring specified in related sections will not be affected by cure/sealer. Apply curing compound in accordance with manufacturer's instructions at the maximum recommended application rate in two coats, with second coat applied at right angles to first.
- G. Formed Concrete Members: Cure by moist curing with forms in place for full curing period.
1. Protect free-standing elements from temperature extremes.
 2. Maintain forms tight for minimum 7 days. Maintain exposed surfaces continuously damp and completely covered by sheet materials thereafter.
 3. Maintain all shoring in place. Refer to related sections specifying formwork.
 4. Membrane Curing Compound: Apply compound in accordance with manufacturer's instructions in one coat.
- H. Foundations: Apply curing compound immediately after floating.

3.04 CONCRETE HARDENER

- A. Apply hardener to all floor slabs not receiving other finishes after 30 days minimum curing. Clean slabs of non-compatible cure/sealers or other foreign material(s) and apply in strict accordance with the manufacturer's directions.

3.05 GROUTING AND DRY PACK

- A. Set steel plates on concrete or masonry with high strength grout bed, completely fill all voids; thoroughly compact in place. See Section 05 1200 or 05 1100.

- B. Bolts or inserts dry packed or grouted in place shall cure for minimum 7 days before tensioning.

3.06 FIELD QUALITY CONTROL

- A. Testing and Inspections by Independent Testing Agency: Provided verification and inspection of concrete per CBC Table 1705.3. Provide written reports for to Engineer, Architect, Contractor and Building Official for the following tests and inspections:
- B. Testing & Inspection: Provide periodic inspection of reinforcing steel. Provide continuous inspection during placement of structural class concrete, 3000 psi or more. Non-structural class concrete with a design strength of 2500 psi or less to have periodic inspection on a 150 cubic yard basis as required to assure conformance.
 - 1. Provide periodic inspection of bolts in concrete prior to and during placement where so noted on the construction documents.
 - 2. Structural Concrete Cylinder Tests: Form in accordance with ASTM C31.
 - a. Take four standard 6 inch x 12 inch (or five 4 inch x 8 inch) cylinder specimens on the site, of each class of concrete as specified in PART 2, not less than once a day or for each 150 cubic yards or 5000 sq ft or fraction thereof placed each day.
 - b. Record the location of each concrete batch in the building in a log and also note on each specimen.
 - c. Perform standard compression test of cylinders in accordance with ASTM C39, one at 7 days and two (three for 4x8 cylinders) at 28 days.
 - d. Hold fourth (fifth) cylinder untested until specified concrete strengths are attained.
 - 3. Structural Concrete Slump Test and Air Tests: Perform slump in accordance with ASTM C143 and air content in accordance with C231 or C173 at the time of taking test cylinders, and/or at one-hour intervals during concrete placing.
 - 4. Measure and record concrete temperature in accordance with ASTM C1064 upon arrival of transit mixers and when taking specimens. Note weather conditions and temperature.
 - 5. Determine concrete density in accordance with ASTM C138 at the time of forming test cylinders.
 - 6. Propose adjustments to reviewed mix designs for Architect / Engineer review to account for variations in site or weather conditions, or other factors as appropriate.
 - 7. Water Vapor Transmission Tests: Floors receiving floor finishes specified in related sections will be tested prior to installation of flooring systems. Refer to sections specifying floor finishes for related requirements.
- C. Services by Contractor:

1. Rejection of Concrete Materials: Do not use the following without prior written approval of the Architect/Engineer;
 - a. Materials without batch plant certificates.
 - b. Materials not conforming to the requirements of these specifications.

3.07 ADJUSTING

- A. Inspect all concrete surfaces immediately upon formwork removal. Notify Architect/Engineer of identified minor defects. Repair all minor defects as directed.
- B. Surface and Finish Defects: Repair as directed by the Architect/Engineer, at no added expense to the Owner. Repairs include all necessary materials; reinforcement grouts, dry pack, admixtures, epoxy and aggregates to perform required repair.
 1. Repair minor defective surface defects by use of drypack and surface grinding. Specific written approval of Architect/Engineer is required. Submit proposed patching mixture and methods for approval prior to commencing work.
 2. Slabs-on- Ground, Elevated Slabs and on Slabs on Metal Deck: Review for "curled" slab edges and shrinkage cracks prior to installation of other floor finishes. Grind curled edges flush, fill cracks of 1/16 inch and greater with cementitious grout.
 3. Grind high spots, fins or protrusions caused by formwork; Fill-in pour joints, voids, rock pockets, tie holes and other void not impairing structural strength. Provide surfaces flush with surrounding concrete.

3.08 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required compressive strength, lines, details, dimensions, tolerances, finishes or specified requirements; as determined by the Architect/Engineer.
- B. Repair or replacement of defective concrete will be determined by the Architect/Engineer who may order additional testing and inspection at his option. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- C. Specific Defects:
 1. "Low-Strength"; Concrete Not Meeting Specified Compressive Strength after 28 days:
 - a. Concrete with less than 25% Fly Ash or 35% Slag as cementitious material: Test remaining cylinder(s) at 56 days. If strength requirements are met, concrete strength is acceptable.
 - b. Concrete with 25% or more Fly Ash or 35% or more Slag as cementitious material: Test remaining cylinder(s) at 70 days. If strength requirements are met, concrete strength is acceptable.
 2. Excessive Shrinkage, Cracking, Crazing or Curling; Defective Finish: Remove and replace if repair to acceptable condition is not feasible.

3. Lines, Details, Dimensions, Tolerances: Remove and replace if repair to acceptable condition is not feasible.
4. Slab sections not meeting specified tolerances for trueness/flatness or lines/levels: Remove and replace unless otherwise directed by the Architect/Engineer. Minimum area for removal: Fifteen square feet area unless directed otherwise by the Architect/Engineer.
5. Defective work affecting the strength of the structure or the appearance: Complete removal and replacement of defective concrete, as directed by the Architect/Engineer.

3.09 CLEANING

- A. Maintain site free of debris and rubbish. Remove all materials and apparatus from the premises and streets at completion of work. Remove all drippings; leave the entire work clean and free of debris.
- B. Slabs to Receive Floor Finishes Specified in other sections: Remove non-compatible cure/sealers or other foreign material(s) which may affect bonding of subsequent finishes. Leave in condition to receive work of related sections.

3.10 PROTECTION

- A. Protect completed work from damage until project is complete and accepted by Owner.
- B. Construction Loads: Submit engineering analysis for equipment loads (including all carried loads) specified in article submittals.
- C. Keep finished areas free from all equipment traffic for a minimum of 4 additional days following attainment of design strength and completion of curing.
- D. Protection of Drainage Systems:
 1. Care shall be taken not to introduce any foreign material into any specified drainage, piping or duct system.
 2. Cost of work to repair or clean drainage system as a result of failure to comply with this requirement will be back charged to the contractor.
- E. Cover traffic areas with plywood sheets or other protective devices; maintain protection in place and in good repair for as long as necessary to protect against damage by subsequent construction operations.

END OF SECTION

SECTION 03 35 00
HIGH DENSITY POLISHED CONCRETE FLOOR FINISH

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Cleaning, preparation, application of HD Concrete Flooring (HDCF), sawcuts, grouting, sealing, application of maintenance coat, and protection in the areas indicated.

1.03 RELATED SECTIONS

- A. Section 03 30 00 – Structural Concrete.

1.04 SUBMITTALS

- A. Submit product data and MSDS sheets for material to be used for HDCF.
- B. VOC Emissions from stains and coatings must not exceed the VOC and chemical component limits of the Green Seal's Standard GS-11 requirements.
- C. Provide two (2) 8" x 10" samples for each of the finishes specified (Finish Schedule: CNC-1, CNC-2, CNC-3) in both 60 grit and 80 grit for approval prior to commencing work. Samples shall be poured two weeks prior to the time the slab is scheduled to be poured and shall be approved by Architect and Fire Department prior to work commencing on actual slab.

1.05 QUALITY ASSURANCE

- A. Quality standards: The standards named herein are specified to establish standards of quality, performance and compliance with the design concrete, which is to duplicate the color of the approved "referee sample".
- B. Single Source Responsibility: Obtain each color, type, and variety and joint materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying work.
- C. Field Constructed Mock-Up: Prior to the installation of any HD, erect mock-ups for each type and pattern of concrete required to verify selections made under sample submittals (Finish Schedule: CNC-1, CNC-2, CNC-3, CNC-4, CNC-5). Build mock-ups to comply with the following requirements, using materials and same base construction including special features for expansion joints, construction joints, surface finishes, textures, colors and contiguous work as indicated for final work.
 - 1. Field Quality Control submittals as specified in Part 3 of this Section.
 - 2. Locate mock-ups on site in location and size indicated or if not indicated, as directed by Architect (36" x 36" min.). Unless directed otherwise by architect, mockups shall not be part of final work.
 - 3. Demonstrate quality and range of aesthetic effects and workmanship that will be produced in final unit of work and accurately match pre-bid "referee sample".
 - 4. Obtain Owner's Authorized Representative acceptance of mock-ups before start of work.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. If scheduled, special surface colors shall be performed using approved colors suitable for the purpose intended and applied in a manner consistent with the design intent of the project. Color shall be as selected by Architect from manufacturer's standard colors.
- B. Impregnator: Ameripolish 3D, HS, Hybrid Silicate Densifier, by Ameripolish, or equal.
- C. Sealer: Ameripolish 3D, SP, by Ameripolish, or equal.

- D. Grout Coating System: Ameripolish PG-7K, by Ameripolish or equal.
- E. All material shall be furnished, prepared, applied, cured and stored according to Product Manufacturer directions specified for use intended as specific herein, with special attention given to recommended temperature range for penetrating color mix.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Preparation: Clean concrete to ensure the surface is free of all latency, dirt, dust, grease, paint and any foreign material prior to the color application in accordance with the color manufacturer's recommendations.
 - 1. Concrete must be cured to a minimum of 28 days prior to application of HD System.

3.02 APPLICATION

- A. Grind concrete with 80 grit up to 320 grit until there is a uniform scratch pattern and desired concrete exposure is achieved per mockup.
- B. Bull float cementitious grout onto surface to fill all voids, cement grout to match color of concrete. Allow to cure overnight.
- C. Apply a densifying impregnator per manufacturer's instructions. Cover the entire work area liberally and allow to sit for 15 minutes. Apply again to areas where the densifying impregnator has soaked in and allow to sit for an additional 15 minutes. Squeegee excess material off the floor.
- D. Polish the surface to match approved sample.

3.03 SEALER

- A. Allow impregnator to completely dry prior to application.
- B. The surface shall be sealed per the manufacturer's recommendations.
- C. Allow sealer to dry before applying second coat.
- D. Burnish between each coat.
- E. Apply additional coats per manufacturer's instructions.

3.04 CLEAN UP

- A. During the progress and at the completion of the work, remove all trash, debris, etc. from the project site and leave the site clean and in an orderly condition.

3.05 PROTECTION

- A. Protect applied colors from adverse climatic conditions during application and curing.
- B. All special finishes of concrete surfaces shall be protected until final acceptance of the project.
- C. Protect floor from traffic for at least 24 hours after final application of sealer.
- D. After sealer has dried sufficiently, install double faced 125# corrugated cardboard sheets on the stained floors. Tape together. Do not tape cardboard directly to stained floors.
- E. Provide floor care manual.

END OF SECTION

SECTION 03 35 33
STAMPED CONCRETE FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stamping of new full-depth concrete.
- B. Stamping of concrete overlay topping over new and existing concrete slabs.
- C. Coloring of stamped concrete.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 03 35 00 - High Density Polished Concrete Floor Finish.

1.03 REFERENCE STANDARDS

- A. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.
- B. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section.
 - 1. Require attendance of parties directly affecting work of this section, including:
 - a. Installer.
 - b. Contractor's representative.
 - c. Landscape architect.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Indicate location of construction and control joints.
- D. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by owner.
 - 1. Submit installer's list of completed stamped concrete projects, including project name and location, and type and quantity of materials applied.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 MOCK-UPS

- A. Prepare mock-up(s) of stamped concrete to serve as basis for evaluation of workmanship.
 - 1. Mock-up(s) can be off-site to show options for design, texture, and color.
 - 2. Use same materials and methods for use in the work.
 - 3. Record technique, timed procedures and material used.
 - 4. Minimum Size: 4 by 4 feet.
- B. Obtain approval of mock-up by Architect before proceeding with work.

1.08 DELIVERY, STORAGE, AND HANDLING

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
STAMPED CONCRETE
FINISHING
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- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store and handle materials in accordance with manufacturer's instructions.
- C. Keep materials in manufacturer's original, unopened containers and packaging until application.
- D. Store materials in clean, dry area indoors and out of direct sunlight.
- E. Keep materials from freezing.
- F. Protect materials during storage, handling, and application to prevent contamination or damage.

1.09 FIELD CONDITIONS

- A. Do not install materials when air and surface temperatures are below 55 degrees Fahrenheit or above 80 degrees Fahrenheit.
- B. Do not install materials when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Stamping and Coloring Materials:
 - 1. Brickform: www.brickform.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STAMPED CONCRETE APPLICATIONS

- A. Full Depth Stamped Concrete Slab - Type 4: Patterned new concrete.
 - 1. Application(s): As indicated on drawings.
 - 2. Pattern: 12" Wood Plank FM-8000S-PRO.
 - 3. Integral Color: Solomon Color - 385 Lava.
 - 4. As last step, apply combination curing compound / clear sealer.
 - 5. Provide all chemical components from a single manufacturer.
- B. Full Depth Stamped Concrete Slab - Type 5: Patterned new concrete.
 - 1. Application(s): As indicated on drawings.
 - 2. Pattern: New England Basket Weave FM3600S-PRO.
 - 3. Integral Color: Solomon Color - 306 Canvas.
 - 4. As last step, apply combination curing compound / clear sealer.
 - 5. Provide all chemical components from a single manufacturer.

2.03 FULL-DEPTH CONCRETE SLAB MATERIALS

- A. See other section(s) for concrete design mix, mixing, forming, and reinforcement.
- B. Slump: 4.0 inches maximum.
- C. Do not use calcium chloride or admixtures containing calcium chloride.
- D. Aggregates: Use non-reactive fine and coarse aggregates free from deleterious material and complying with ASTM C33/C33M.

2.04 STAMPING MATERIALS

- A. Stamping Mats: Mat type imprinting tools for texturing freshly placed concrete, in pattern and texture to achieve required surface profile and design.
 - 1. Mat Composition: Polyurethane.
- B. Release Agent: Bond breaker compound capable of releasing stamping forms from concrete without creating surface defects or leaving any residue; type as recommended by stamping mat manufacturer; compatible with concrete, form materials and specified coloring agents.

1. Liquid Release Agent: Self-dissipating, colorless liquid type; intended to be used on both stamping mats and on concrete surface.
 - a. Products:
 - 1) Brickform: www.brickform.com.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
2. Dry Type Release Agent: Pigmented; for application to concrete surface using broadcast method; intended to be substantially removed using water.
 - a. Color(s): To be selected by Architect from manufacturer's full line.
 - b. Products:
 - 1) Brickform: www.brickform.com.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.

2.05 INTEGRAL COLORING AGENTS

- A. Concrete Pigment: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
 1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
 2. Packaging: If pigments are to be added to mix at site, furnish pigments in premeasured disintegrating bags to minimize job site waste.
 3. Color(s): As selected by Architect from manufacturer's full range.
 4. Products:
 - a. Brickform: www.brickform.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 SURFACE TREATMENTS

- A. Clear Sealer: Suitable for interior and exterior application.
 1. Composition: Acrylic, water-based.
 2. Do not use in the presence of hydrostatic pressure or on dense surfaces.
 3. Sheen: Low sheen, matte.
 4. Solids Content: Minimum of 25 percent.
 5. Color: Clear.
 6. Slip Resistant Additive: Safety-Seal.
 7. Products:
 - a. Brickform: www.brickform.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and areas to receive stamped concrete.
- B. Verify that utility penetrations and peripheral work are complete.
- C. Notify Architect of conditions that would adversely affect application or subsequent use.
- D. Do not begin preparation or application until unacceptable conditions are corrected.

3.02 PREPARATION

- A. Protect adjacent surfaces, areas, adjoining walls, and landscaping from overspray, blown dry materials, and damage due to work of this section.
- B. Immediately remove dry pigmented materials from surfaces on which they are not intended to be applied.
- C. See Section 03 01 00 for cleaning and resurfacing of existing concrete.

3.03 FULL-DEPTH CONCRETE SLABS INSTALLATION

- A. See other section(s) for concrete forming and placement.

- B. Verify that concrete sub-floor surfaces are ready for stains, colorants or sealers by testing for moisture and alkalinity; obtain instructions if test results are not within the acceptable limits.

3.04 STAMPING

- A. Match approved mock-ups for pattern, color, texture, and workmanship.
- B. Use stamping mats to create patterns in concrete as indicated on drawings; comply with manufacturer's recommendations and instructions.
- C. Use release agent to prevent damage to concrete surface or creation of bugholes during mat removal.
- D. After removal of stamping mats, make minor surface repairs as required.

3.05 CURING

- A. Protect recently placed materials from premature drying, excessive hot or cold temperatures and mechanical injury until fully cured.

3.06 SURFACE TREATMENTS

- A. Match approved mock-ups for pattern, color, texture, and workmanship.
- B. Wait at least 28 days before applying any surface treatment materials or mechanical finishing.
- C. Clean curing agent residue off surface prior to application of surface treatment materials.
 - 1. Apply concrete cleaner in accordance with manufacturer's instructions to remove excess form release agent, efflorescence, cement scale and curing agents.
- D. Sealer/Coating Application: Apply uniformly over entire surface in accordance with manufacturer's instructions.

3.07 PROTECTION

- A. Do not allow traffic on finished surfaces for the following periods after application:
 - 1. Foot Traffic: Minimum 24 hours.
 - 2. Heavy Traffic: Minimum 72 hours.
- B. Protect finished work from damage during construction and ensure that, except for normal weathering, work will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

**SECTION 03 54 00
CAST UNDERLAYMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Liquid-applied self-leveling floor underlayment.
 - 1. Use gypsum-based type.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry
- B. Section 09 65 00 Resilient Flooring

1.03 REFERENCE STANDARDS

- A. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.
- C. Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Instructions.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.07 FIELD CONDITIONS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.
- C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gypsum Underlayment:
 - 1. ARDEX Engineered Cements; ARDEX K 22 F: www.ardexamericas.com/#sle.
 - 2. Maxxon Corporation; Commercial EZ Crete: www.maxxon.com/#sle.
 - 3. USG; Levelrock CSD Early Exposure Series Floor Underlayment: www.usg.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Sound Control Mat:
 - 1. AcoustiGuard - WILREP LTD; ISO-SEP 25HD Rubber Isolation Pads: www.acoustiguard.com/#sle.
 - 2. Maxxon Corporation; Maxxon Acousti-Mat 1/4: www.maxxon.com/#sle.
 - 3. USG; Levelrock SAM-N25 Supreme Sound Attenuation Mat: www.usg.com/#sle.

- 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Primer:
 - 1. Per Manufacturer's recommendation.
- D. Moisture Barrier:
 - 1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Cast Underlayments, General:
 - 1. Comply with applicable code for combustibility or flame spread requirements.
- B. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
 - 1. Compressive Strength: Minimum 2500 pounds per square inch, tested per ASTM C472.
 - 2. Density: Maximum ____ pounds per cubic foot.
 - 3. Final Set Time: 1 to 2 hours, maximum.
 - 4. Thickness: 3/4 inch to maximum 3-1/2 inch.
 - 5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.
- C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.
- D. Primer: Manufacturer's recommended type.
- E. Joint and Crack Filler: Latex-based filler, as recommended by manufacturer.
- F. Sound Control Mat: Sheet material 1/4" thick, perimeter isolation strip, and tape; as recommended by underlayment manufacturer.

2.03 MIXING

- A. Site mix materials in accordance with manufacturer's instructions.
- B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.
- C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

- A. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.
- B. Vacuum clean surfaces.
- C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.
- D. Close floor openings.
- E. Install sound control mat in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Pump or pour material onto substrate. Do not retemper or add water.
 - 1. Pump, move, and screed while the material is still highly flowable.
 - 2. Be careful not to create cold joints.
 - 3. Wear spiked shoes while working in the wet material to avoid leaving marks.

- C. Place to indicated thickness, with top surface level to 1 inch.

3.04 CURING

- A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.
- B. Air cure in accordance with manufacturer's instructions.

3.05 FIELD QUALITY CONTROL

- A. Verify underlayment material is installed per manufacturer's recommendations to the thickness required by the Architect.
 - 1. Provide documentation that the floor finish materials will be at the specified height and locations as designed

3.06 PROTECTION

- A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.
- B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

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**SECTION 04 20 00
UNIT MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories
- B. Section 03 20 00 - Concrete Reinforcing
- C. Section 03 30 00 - Cast-in-Place Concrete
- D. Section 07 25 00 - Weather Barriers: Water-resistive barriers applied to exterior face of unit masonry.
- E. Section 07 62 00 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.
- F. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
- G. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- B. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- C. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- D. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.
- E. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.
- F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- G. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- H. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.
- I. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- J. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
 - 1. Include calculations or selections from the manufacturer's prescriptive design tables that indicate compliance with the applicable building code and project conditions.
 - 2. Include the design engineer's stamp or seal on each sheet of shop drawings.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- E. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.

2.02 MORTAR AND GROUT MATERIALS

- A. Water: Clean and potable.
- B. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Color: Architect to select from standard manufacturer's colors.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: See size as indicated on drawings; epoxy finish.
- B. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss or ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.

2.04 FLASHINGS

- A. Membrane Asphaltic Flashing Materials:

1. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet; 40 mils minimum total thickness; 8 mil cross-laminated polyethylene bonded to adhesive rubberized asphalt, with a removable release liner.

2.05 ACCESSORIES

- A. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 1. Masonry below grade and in contact with earth: Type S.
 2. Exterior, non-loadbearing masonry: Type S.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

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

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 1. Bond: Running.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- D. Interlock intersections and external corners, except for units laid in stack bond.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.06 GROUTED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

- C. Place and consolidate grout fill without displacing reinforcing.

3.07 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

3.08 BUILT-IN WORK

- A. As work progresses, install built-in anchor bolts, plates, and support for the gate and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Do not build into masonry construction organic materials that are subject to deterioration.

3.09 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation from Plumb: 1/4 inch
- C. Maximum Variation from Level Coursing: 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- D. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.10 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.12 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.13 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: All labor, materials, equipment and operations required to complete structural and miscellaneous metals in shapes and configurations indicated; including:
 - 1. Structural steel columns, beams, bracing, base plates, bolts, joist hangers, and stud bolts welded to structural steel.
 - 2. Miscellaneous structural steel and connections; fabricated connectors and hangers installed by related sections.
 - 3. Anchor bolts and steel inserts embedded in concrete or masonry, installed by related sections.
 - 4. Fabricated steel items embedded in concrete or masonry installed by related sections.
 - 5. Supervision of anchor bolt setting, leveling and elevations to ensure required fit of steel work.
 - 6. Shop priming and field touch-up, galvanizing.
 - 7. Bracing, Shoring, Fabrication and Erection.
- B. Related Sections:
 - 1. Pertinent sections of Division 01 specifying Quality Control and Testing Agency services.
 - 2. Pertinent Sections of other Divisions specifying concrete reinforcement, formwork, concrete, structural and miscellaneous metal fabrications, steel joists, metal decking, cold-formed metal framing, rough carpentry.

1.02 REFERENCES

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 22 Steel.
- B. American Institute of Steel Construction (AISC) 303 "Code of Standard Practice for Steel Buildings and Bridges".
- C. AISC 341 "Seismic Provisions for Structural Steel Buildings".
- D. AISC 358 "Prequalified Connection for Special and Intermediate Steel Moment Frames for Seismic Applications".
- E. AISC 360 "Specification for Structural Steel Buildings".
- F. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel".
- G. AWS D1.8 "Structural Welding Code - Seismic Supplement".

- H. Research Council on Structural Connections (RCSC) "Specification for Structural Joints Using High-Strength Bolts".
- I. Underwriters Laboratories (UL) FRD "Fire Resistance Directory".

1.03 SUBMITTALS

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.
- C. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.
- D. Shop drawings: Submit each building as a complete unit. Do not mix components from multiple buildings or units of work in a submittal. Include all of the following;
 - 1. Profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Fabrication tolerances for all steel.
 - 3. Connections: All, including type and location of shop and field connections.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths, type, size, and sequence. Designate demand critical welds.
 - 5. Designation of Seismic Force Resisting System (SFRS) members and connections. Locate and dimension protected zones. Braced frame gusset plates shall be drawn to scale.
 - 6. Cross-reference all shop drawing detail references to contract document detail references.
 - 7. Secure all field measurements as necessary to complete this work prior to submitting shop drawings for review.
 - 8. Provide holes, welded studs, etc. as necessary to secure work of other sections.
 - 9. Provide the following as separate submittals for each building or unit of work:
 - a. Bolt and anchor setting plans.
 - b. Layout, fabrication and erection drawings.
- E. Certifications:
 - 1. Steel Materials: Submit the following for identified materials.
 - a. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
 - b. Mill Test Reports: Indicate structural strength, destructive test analysis, and non-destructive test analysis.
 - c. Contractor's affidavit certifying that all identified steel materials provided are of the grades specified and match the certificates supplied.

2. High-Strength Bolting: Certify all materials provided are the grades specified.
 3. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification per AWS D1.1.
- F. Samples: Provide samples to the Testing Agency as specified in Article SOURCE QUALITY CONTROL, at no additional costs.

1.04 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies, refer to pertinent sections of Division 01 and CBC Chapter 17.
- B. All tests shall be performed by a recognized testing agency as specified in pertinent sections of Division 01.
- C. Certification and Identification of Materials and Uses: Provide Testing Agency with access to fabrication plant to facilitate inspection of steel. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection and all material identification/test information listed below.
1. Test all steel as required by ASTM A6.
 2. Provide manufacturer's Mill Test Reports for all materials. Include chemical and physical properties of the material for each heat number manufactured. Tag all fabricated materials with heat number.
 3. Provide letter certifying all materials supplied are from heat numbers covered by supplied mill certificates. Include in letter the physical location of each material type and/or heat number in the project (i.e. walls, braced frames etc.).
 4. Unidentified Material Tests: Where identification of materials by heat number or mill tests cannot be made, Owner's Testing Agency shall test unidentified materials.
 5. Provide all certification, verifications, and other test data required to substantiate specified material properties at no additional cost to the Owner.
- D. Testing and Inspection: Tests and Inspections performed by Independent Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and test reports in conformance with pertinent sections of Division 01.
- E. The following standards are the minimum level of quality required. Provide higher quality work as specifically indicated in the Contract Documents.
1. Workmanship and details of structural steel work shall conform to the CBC and AISC 360.
 2. The quality of materials and the fabrication of all welded connections shall conform to AWS D1.1 and D1.8.
 3. Comply with Section 10 of AISC 303 for architecturally exposed structural steel.
- F. The Testing Agency will review all submittals and testing of materials.
- G. All re-inspections made necessary by non-conforming work shall be at the Contractor's expense.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in bundles marked with durable tags indicating heat number, mill, member size and length, proposed location in the structure and other information corresponding with markings shown on placement diagrams.
- B. Handle and store materials above ground to prevent damage, contamination or accumulation of dirt or rust.

1.06 SCHEDULING AND SEQUENCING

- A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the Testing Agency.
- B. Provide schedule and sequence information to Testing Agency in writing upon request. Update information as work progresses.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel W Shapes: ASTM A992 Gr. 50 or ASTM A572 Gr. 50.
- B. Structural Steel Plates: ASTM A36 or ASTM A572 Gr. 50 or ASTM A529 Gr. 50
- C. Structural Steel Channels, Angles: ASTM A36 or ASTM A572 Gr. 50.
- D. HSS (Hollow Structural Sections):
 - 1. Round: ASTM A500, Gr. C.
 - 2. Rectangular or Square: ASTM A500, Gr. C.
- E. Pipe: ASTM A53, Grade B.
- F. Bolts and Washers: See FINISHES section for galvanization, where required.
 - 1. Machine Bolts, Nuts, and Washers: Bearing and shear connections (denoted as "MB"); ASTM A307 Grade A machine bolts with ASTM A563 Grade A nuts and ASTM F844 washers to match.
 - 2. High Strength Bolts, Nuts, and Washers: Bearing and shear connections (denoted as "HSB"); ASTM F3125 Grade A325 with ASTM A563 Grade C nuts and ASTM F436 Type 1 washers. Where noted on the drawings provide ASTM A490 bolts with ASTM A563 Grade DH nuts and ASTM F436 Type 1 washers.
 - a. HSB-N: For use in snug tight (ST), pretensioned (PT), and slip critical (SC) joints. Conform to the RCSC Specifications.
 - b. HSB-X: For use where specified on the drawings.
 - c. At Grade A325 bolts use of Grade F1852 (twist off assemblies) is permitted conforming to requirements of RCSC Specifications. At Grade A490 bolts, Grade F2280 is permitted.
 - d. Use of ASTM F959 Load Indicator Washers is permitted conforming to the requirements of RCSC Specifications.
 - e. Slip critical (SC) bolt faying surfaces shall be prepared per RCSC as Class A, unless noted to be Class B per the drawings. Galvanized surfaces at SC bolts shall be hand wire brushed.

- G. Headed Stud Type Shear Connectors: AWS D1.1 Type B.
- H. Deformed Bar Anchors: ASW D1.1 Type C from ASTM A496 material.
- I. Anchor Bolts/Rods:
 - 1. ASTM F1554 Grade 36 or 55 with ASTM A563 Grade A nuts and ASTM F436 Type 1 washers.
 - 2. ASTM F1554 Grade 105 where indicated on plans with ASTM A563 Grade DH nuts and ASTM F436 Type 1 washers.
 - 3. No upset thread allowed.
- J. Arc-Welding Electrodes: AWS Standards E70 or equivalent, except no E70T-4 allowed. Additionally, welding electrodes to be used in the welding of seismic force resisting system to conform to AISC 341 and AWS D1.8.
- K. Other Welding Materials: AWS D1.1; type required for materials being welded.

2.02 ACCESSORIES

- A. High Strength Grout: ASTM C1107, non-shrink, premixed compound consisting of aggregate, cement, and water reducing plasticizing agents.
 - 1. Minimum Compressive Strength at 3 days: 3000 psi, placed in a "fluid" state.
 - 2. Minimum Compressive Strength at 28 days: 7000 psi, placed in a "fluid" state.
 - 3. Provide only non-metallic grout at exposed work.
 - 4. Meet or exceed properties of BASF "Master Flow 928" mixed to fluid consistency. Other acceptable manufacturers: The Burke Company and W.R. Meadows, Inc.
- B. Building Structural Steel Primers: Comply with local VOC limitations of authorities having jurisdiction and the California Green Building Code. Verify compatibility with finish coats specified in other sections. Follow manufacturers printed instructions. Apply one coat unless otherwise directed.
 - 1. Type A: Self-Crosslinking Hydrophobic Acrylic passing 2000 hours ASTM D4585 and 7000 hours ASTM D5894. "Series 115 Uni-Bond DF" by Tnemec (2.0 to 4.0 mils DFT).
 - 2. Type B: Organic Zinc-Rich Urethane passing 50,000 hours ASTM B117 and 15000 hours ASTM G85. "Series 90-97 Tneme-Zinc" by Tnemec (2.5 to 3.5 mils DFT) or "Series 94-H2O Hydro-Zinc" by Tnemec (2.5 to 3.5 mils DFT).
 - 3. Type C: MIO-Zinc Filled Urethane passing 10,000 hours ASTM B117 and 5000 hours ASTM D4585. "Series 394 PerimePrime" by Tnemec (2.5 to 3.5 mils DFT).
- C. Galvanizing: ASTM A153 and A123.
- D. Touch-Up Primer for Galvanized Surfaces: Type B primer.

2.03 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Continuously seal built up members by continuous welds where exposed to weather.
- C. Fabricate connections for bolt, nut, and washer connectors.
- D. Protect all materials, before and after fabrication, from rust, corrosion, dirt, grease, and other foreign matter.
- E. Fabricate framing members free from twists or bends. Form holes, cut and sheared edges neatly without kinks, burrs, or warped edges.
- F. Exposed Steel: Straight, smooth, free of nicks, scars or dents.
- G. Gas Cutting: Gas cutting of holes in a member shall not be permitted.
- H. Splicing of members: Members requiring splicing due to length requirements may be spliced using full penetration butt welds when such welds and procedures are inspected and certified by the Testing Agency, in conformance with AWS and AISC standards. The location of splices shall be approved by the Architect/Engineer in writing prior to fabrication.
- I. Welding: Welding of structural steel connections shall be performed by qualified welders in accordance with AWS Standards. All weld sizes shall match those shown on the drawings.
 - 1. Preparation: Clean all surfaces free of rust, paint and all foreign matter. Remove paint or scale by brushing, chipping or hammering as required. Chip clean and wire brush burned or flame cut edges before welding. Space and alternate welds, clamping as necessary to prevent warp or misalignment.
 - 2. Sequence Welding: When welds enclose, or partially enclose, the perimeter or portion of the surface of a member, make weld bead in sequence, or staggered. Minimize internal stresses. Weld groups of members occurring in a single line in staggered sequence to minimize distortion of the structural frame.
 - 3. Faulty and Defective Welding: Welds failing to meet AWS standards and the Contract Documents shall be rejected and remade at Contractor expense. All welds showing cracks, slag inclusion, lack of fusion, bad undercut or other defects, ascertained by visual or other means of inspection shall be removed and replaced with conforming work.
 - 4. Minimum Weld Strengths: All welds shall match the minimum weld sizes recommended by AISC. Details of fabrication not specifically shown shall match similar details which are specifically shown. All bevel and groove welds shall be full penetration unless size is noted otherwise.
 - 5. Threaded studs, headed studs, and deformed bar anchors shall be full-fusion welded conforming to ASW D1.1.
- J. Camber: Fabricate all beams cambered as indicated on the drawings.
 - 1. Fabricate beams without camber for installation with any "natural" crown up.
 - 2. Exception: Fabricate cantilever beams with "crown" down.
- K. Grinding: Grind smooth the following structural steel and connections;

1. Exposed cut ends of structural and fabricated shapes.
 2. All welds exposed to view.
 3. Mitered and fit-up corners and intersections.
- L. Back-Up Bars: Required for all complete penetration welds. See requirements of AISC 358.
- M. Bolt Holes: Edge, end distances and spacing shall conform to dimensions shown on the drawings, and as follows;
1. Round: Size indicated and 1/16 inch maximum oversize, except 1 inch and larger bolts may have 1/8 inch maximum oversize.
 2. Slotted: At locations specifically noted on the drawings, provide size indicated and 1/16 inch by 1/4 inch oversize slotted in direction perpendicular to applied loads.
 3. Holes in base plates for anchor bolts may be 1/8 inch oversize.
- N. Comply with Section 10 of AISC 303 for architecturally exposed structural steel (AESS). See architectural & structural drawings for locations of AESS.

2.04 FINISHES

- A. Steel exposed to inclement atmospheric conditions or weather (such as coastal moisture or seasonal rain) shall be sufficiently primed or otherwise protected against corrosion. If condition of steel is suspect due to weathering/corrosion, Contractor shall bear cost of inspection to determine if excessive corrosion is present and if steel member(s) requires repair or replacement. Contractor shall bear cost of repair or replacement.
- B. Prepare and finish structural and miscellaneous steel component surfaces as follows, unless a higher standard-of-care is determined necessary per item A:
1. Unpainted, interior, dry exposure surfaces need not be primed.
 2. Finished painted, interior, dry exposure surfaces:
 - a. Surface Preparation: SSPC-SP2 Hand-Tool and/or SP3 Power-Tool Cleaning. Apply Primer Type A. Field touchup with same primer.
 - b. Where jobsite exposure is expected to exceed 6 months, SSPC-SP6 / NACE No. 3 Commercial Blast-Cleaning is required. Apply Primer Type B or C. Field touchup with same primer.
 3. Finish painted surfaces with exterior exposure, interior exposure subject to wet conditions or fumes, or surfaces to receive high performance finish coatings (for example epoxy or urethane coatings).
 - a. Surface Preparation: SSPC-SP6 / NACE No. 3 Commercial Blast-Cleaning to create a dense, uniform angular surface profile of 2.0 mils minimum. For severe (immersion) exposure, SSPC-SP10 / NACE No. 2 Near-White Blast-Cleaning is required.
 - b. Apply Primer Type B. Field touchup with same primer.
 4. Surfaces to be fire proofed need not be primed unless required by the fireproofing manufacturer or if jobsite exposure is expected to be inclement per item A. Where unprimed steel is to receive fireproofing, prepare steel surface as required by fireproofing manufacturer. If fireproofed surfaces are to be primed, provide primer as follows:

- a. Surface Preparation: SSPC-SP3 Power-Tool Cleaning.
 - b. Apply Primer Type C. Field touchup with same primer.
- 5. Exterior exposed (unpainted) surfaces and as otherwise indicated to receive galvanizing:
 - a. Galvanize per ASTM A123 Class 55 minimum. Passivation agents are not permitted on galvanized metal that is to be painted. Provide vent holes per ASTM A385 at closed sections (such as HSS). Submit proposed location of vent holes for review by Engineer.
 - b. Connection hardware shall be hot-dip galvanized per ASTM A153 or F2329. Grade A325 high-strength bolt assemblies may be mechanically galvanized per ASTM B695 class 55 or hot-dip galvanized per ASTM F2329. Mating bolts and nuts shall receive the same zinc-coating process.
 - c. Repair all uncoated, damaged, or altered galvanized surfaces per ASTM A780.
- C. Do not prime the following surfaces unless otherwise indicated:
 - 1. Connections to be field welded.
 - 2. Steel in contact with concrete.
 - 3. Surfaces to receive welded metal decking.
- D. Slip critical bolted connection surfaces shall either be unfinished & prepared per the RCSC or primed per item B3 or B4.
- E. Do not cover up work with finish materials until inspection is complete and work is approved by the Testing Agency.

2.05 SOURCE QUALITY CONTROL

- A. An independent Testing Agency will perform source quality control tests and submit reports, as specified in pertinent sections of Division 01.
- B. Steel Materials Testing:
 - 1. No testing is required for materials identified in accordance with CBC Section 2202.1 (heat number, grade stencil, etc.).
 - 2. Unidentified steel- General: Test all structural shapes. In addition, test to verify F_y and F_u values when engineering requirements exceed $F_y = 25$ ksi for design.
 - 3. Charpy V-Notch (CVN) testing requirements are per AISC 341. Heavy sections requiring CVN testing are indicated on the documents.
- C. Shop Welding Inspection:
 - 1. Testing Agency shall inspect and certify all structural welds, unless the fabricating shop has been accredited in conformance with CBC requirements. Submit certification to the Architect/Engineer for review and the Building Official for approval.
 - 2. Welder Qualifications: Welding inspector shall verify that all the welders are properly qualified prior to steel fabrication and state the qualifications of each welder in the welding inspection report.

3. Welding Inspection: Continuous inspection required unless otherwise noted below. Comply with requirements of AWS D1.1, AWS D1.8 and AISC 341.
 - a. Welding Inspector shall check all welds, materials, equipment and procedures.
 - b. Welding Inspector shall provide reports certifying the welding is as required and has been done in conformity with the plans, specifications and codes.
 - c. Welding Inspector shall use radiographic, ultrasonic, magnetic particle, or any other necessary aid to visual inspection to assure adequacy of welds.
 4. Periodic Inspection Acceptable:
 - a. Single pass fillet welds not exceeding 5/16 inch.
 - b. Welding of studs to beams.
- D. Bolts, Nuts and Washers: Provide samples to Testing Agency for required testing, at no additional cost.
- E. High Strength Bolted Connections: Provide testing and verification of shop-bolted connections in accordance with RCSC specifications. Test all bolts at each connection.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Framing:
1. Erect all structural steel true and plumb.
 2. Verify proper final alignment prior to making final connections.
- C. Field Connections:
1. Workmanship of field bolted and welded connections shall conform in all respects to methods and tolerances specified for fabrication.
 2. Field weld components indicated on shop drawings. Sequence field welds to minimize built-up stress and distortion of the structural frame. Verify sequence with Engineer. Coordinate field welding schedule with Testing Laboratory.
 3. Welded Studs: Install in accordance with manufacturer's instructions and structural welding code AWS D1.1 and AWS D1.8.
- D. Templates: Provide bolt setting templates for all anchor bolts. Provide instructions for the setting of anchors and bearing plates, verify these items are set correctly as work progresses.
- E. Column base plates: Set level to correct elevations, support temporarily on steel wedges, shims, or leveling nuts where shown, until the supported members are plumbed and base plate is grouted.

1. Grout solid the full bearing area under base plates prior to installation of floor and/or roof decks.
2. Comply with manufacturer's instructions for high strength grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees, or form edges vertical 1in-2in away from base plate edges. Top of grout outside of base plate footprint shall not extend higher than bottom of base plate.

F. Bolting - General:

1. Inspect mating surfaces to ensure that bolt head and nut will have full bearing and that metal plies will mate flush between bolts.
2. Install bolts in matching holes. Do not distort metal or enlarge holes by drifting during assembly. Remake mismatched components to achieve tolerances indicated.
3. Holes mismatched in excess of 1/8 inch will be rejected.
4. Holes mismatched less than 1/8 inch may be reamed to the next larger size bolt.
5. Do not enlarge holes by flame cutting or air/arc ("plasma") cutting.
6. Provide flat washer(s) at over-size holes.
7. Provide washers for all conditions per RCSC Section 6 and under nuts to connected parts less than 1/4 inch thick.
8. Provide ASTM F436 beveled washers when the slope of the surfaces of parts in contact with the bolt head or nut is greater than 1:20.
9. Do not install bolts with damaged threads.
10. Threads shall commence outside of the shear plane where noted as HSB-X on drawings.

G. Bolting - Specific:

1. Machine Bolts (MB): Install and tighten to a snug condition (ST) such that laminated surfaces bear fully on one another, using an impact wrench or "full effort" of an installer using a standard spud wrench.
2. High Strength Bolts in Bearing/Shear or Static Tension joints snug tight (ST):
 - a. Provide a hardened washer at the head/nut at slotted holes
 - b. Install and tighten as per Machine Bolts (MB) snug tight (ST) and other requirements of RCSC specification Section 8.
 - c. Use ASTM F436 washer only in snug tight connections with static tension loads.
3. High Strength Bolts in Pretensioned joints (PT):
 - a. Provide ASTM F436 washer per requirements of RCSC Section 6.
 - b. Install and tighten in accordance with the requirements of RCSC Section 8.
 - c. Install bolts in all holes of the joint and compact the joint until the connected plies are in firm contact prior to pretensioning.
 - d. The following tightening methods and bolt type are acceptable for PT joints:
 - (a) Turn-of-the-nut pretensioning method

- (b) Calibrated wrench pretensioning method
- (c) Twist-off-type tension-control bolts
- (d) Direct-tension-indicator washer pretensioning method.

- 4. High Strength Bolts in Slip Critical (SC) joints:
 - a. Provide tensioning for High Strength Bolts (PT) per above.
 - b. Faying surfaces to be prepared per RCSC Section 3 and PART 2.

H. Supports, Shoring and Bracing: Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing. Conform to requirements of all applicable laws and governing safety regulations. Resist imposed loads, including those of stored materials and equipment.

- 1. Provide all temporary supports, shoring and bracing necessary to achieve work of tolerances indicated.
- 2. Provide all necessary temporary flooring, planking and scaffolding required for erection of steel, and support of erection machinery.
- 3. Construction Loading: Do not overload the structure or temporary supports with stored materials, equipment or other loads.
- 4. Maintain temporary bracing and shoring until work is complete, and longer as required to ensure stability and safety of structure.

I. Do not make final connections until structure is aligned to meet specified tolerances.

3.03 ERECTION TOLERANCES

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

3.04 FIELD QUALITY CONTROL

- A. The independent Testing Agency will perform field quality control tests, as specified in pertinent sections of Division 01.
- B. Field Welding Inspection: Conform to all requirements of section SOURCE QUALITY CONTROL.
- C. High Strength Bolting: Provide testing and verification of field-bolted connections in accordance with RCSC Section 9.
 - 1. Inspect mating surfaces.
 - 2. Test all materials prior to use. Use only materials meeting specified requirements.
 - 3. Inspector shall review installation and verify "full effort" with installers for ST joints and shall randomly manually verify "full effort" on 10 percent of installed bolts.
 - 4. Inspector shall verify installation for 100% of SC and PT joints.
 - 5. Review installation procedures for all types of HSB joints and verify installation of "Twist-off" and load-indicator type bolts.

6. If any bolt fails testing, all bolts at the joint shall be loosened and re-tightened.
Exception: Galvanized bolts shall be replaced prior to re-testing.
- D. Welded Studs: Test headed studs electro-magnetically welded through metal deck to directly to steel members as follows:
 1. Install minimum of two trial studs.
 2. Testing Agency shall bend studs with a hammer to minimum 30 degrees out of axis.
 3. Any failure shall require new studs be welded for another test and welding apparatus adjusted.

3.05 ADJUSTING

- A. Touch-up damaged finishes with compatible specified primer.
- B. Replace defective or damaged work with conforming work. Replace all defective work at Contractor's expense.
- C. Straighten materials by means that will not injure the materials.
- D. Replace defective or damaged work which cannot be corrected in the field with new work, or return defective items to the shop for repair.
- E. Architect/Engineer shall review all proposals for the repair or replacement of damaged, defective, or missing work.
- F. Pay expenses incurred by Owner for Architect/Engineer's costs for (re-)design and obtaining approvals of Authorities Having Jurisdiction (AHJ) necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work, as specified in pertinent sections of Division 01.
- G. Pay expenses due to re-testing and re-inspection necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work, as specified in pertinent sections of Division 01.

3.06 CLEANING AND PROTECTION

- A. Clean all surfaces upon completion of erection; leave free of grime and dirt. Remove unused materials, tools, equipment and debris from the premises and leave surfaces broomed clean.
- B. Protect work from damage by subsequent operations.

END OF SECTION

SECTION 05 12 24

PREFABRICATED SPECIAL STEEL MOMENT CONNECTIONS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Prefabricated steel moment frame connections are designed and fabricated as a part of a special steel moment frame that will support gravity loads and resist lateral in-plane wind or earthquake loads.
- B. As part of the Yield-Link Moment Connection Simpson Strong-Tie supplies (2) Yield-Links, (2) buckling restraint plates and (4) spacer plates per steel moment connection. Continuity plates, shear plates, doubler plates and all fasteners are provided by others as noted in the Structural Drawings.

1.02 RELATED SECTIONS

- A. Section 05 12 00 – Structural Steel Framing

1.03 SUBMITTALS:

- A. Shop and Erection Drawings: Show location, fabrication and assembly of structural beam and column with Yield-Link Moment Connections.
- B. On each sheet of structural drawings/shop detail drawings that contains technical information showing the Simpson Strong-Tie Yield-Link Moment Connections, the following notice of intellectual property must be fixed before release for intended use:
Simpson Strong-Tie® Strong Frame® and Yield-Link® Structural Fuse are protected under one or more of the following patents and applications: US patent no. 8,001,734 B2, US patent no. 8,375,652 B2, US patent publication no. 2015/0159362, US patent publication no. 2017/0138043, and US patent publication no. 15/935,412 and must be supplied or licensed thru Simpson Strong-Tie Company Inc. Other US and international patents pending. Yield-Link moment connection is manufactured and protected under US patent no. 10,669,718 B2 and cannot be duplicated or fabricated without expressed, written permission from Strong Strong-Tie Co., Inc.
- C. Mill certificates of Yield-Links, spacer plates and buckling restraint plates.

1.04 QUALITY ASSURANCE

- A. Comply with the applicable provisions of the following specifications and documents:
 - 1. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges
 - 2. AISC 358 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications

3. ASTM F3125 – Standard Specification for High Strength Structural Bolts and Assemblies.
4. ASTM A992 –Structural Steel Shapes
5. AWS D1.1 – Structural Welding Code – Steel
6. AWS D1.8 – Structural Welding Code Seismic Supplement
7. ESR-2802 – Simpson Strong-Tie Strong Frame Steel Moment Frame Connection
8. ICC-ES AC129 – Acceptance Criteria for Steel Moment Connection Systems

B. Conduct pre-installation conference at project site.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to job site in manufacturer's or distributor's packaging undamaged, complete with installation instructions.
- B. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.
- C. Store fasteners in a protected place in sealed containers in accordance with manufacturer's requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Simpson Strong-Tie Company, Inc.

2.02 MATERIALS

- A. Structural Steel:
 1. W-shape for beam and columns: ASTM A992, unless noted otherwise (U.N.O.)
 2. Built-up column: W-section (ASTM A992), WT-Section (cut from ASTM A992 W-section)
 3. Shear plate, Stiffener Plate, Doubler Plate: ASTM A572 Gr. 50 (U.N.O.)
- B. Yield-Link Connection:
 1. Yield-Links® (W-links): ASTM A992

2. Yield-Links (Welded): ASTM A572, Grade 50
3. Buckling restraint plate (BRP): ASTM A572 Gr 50, unless noted otherwise
4. Spacer plates: ASTM A572 Gr 50, unless noted otherwise

C. Weld Filler Metal:

1. Low hydrogen type conforming to AWS D1.1 Table 3.1, with a minimum yield of 70 ksi.
2. Notch toughness meet 20-lb-ft at 0° F; in addition, demand critical (DC) welds meet CVN toughness of 40- lb-ft at 70° F per AWS D1.8.

D. Bolts:

1. Yield-Link flange-to-column flange: ASTM F3125 Grade A325-N or F1852-N
2. Yield-Link stem-to- beam flange: ASTM F3125 Grade A490 or F2280
3. Shear Plate-to-beam web: ASTM F3125 Grade A325, A490, F1852 or F2280 (X or N type per design)
4. BRP-to-beam flange bolts: ASTM F3125 Grade A325-N (A325-X for YL8-6 and YL8-6-15)

E. Finishes:

1. Orange paint for Yield-Links
2. Gray Primer for buckling restraint plates (BRP) and spacer plates (SP)

2.03 FABRICATION

A. Yield-Link Connection:

1. Shop assembly for welded links to occur per the manufacturer's approved production drawings.
2. Fabrication tolerances per manufacturer.
3. The manufacturer's identification shall be stamped into the metal or a label may be attached to the part with adhesive. Three sets of numbers are noted in the link stem: 1) 6 digit batch number, 2) 6 digit date of manufacture and, 3) Link ID.
4. Yield-Link moment connection is manufactured and protected under US patent no. 10,669,718 B2 and cannot be duplicated or fabricated without expressed, written permission from Strong Strong-Tie Co., Inc.

- B. Structural Steel:
 - 1. Fabricate in accordance with AISC 303, AISC 360 and AISC 341.
 - 2. Thermal cutting of bolt holes in the beam/column receiving the Yield-Link connection is not acceptable.
- 2.04 PRIMING, PAINTING AND GALVANIZING
- A. Hot-Dip Galvanized Finish: Galvanizing of the Yield-Links is not permitted.
 - B. Beam flange surfaces in contact with the Yield-Link bolted connection region shall be unpainted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surface by either SSPC-SP 2 (Hand Tool Cleaning) or SSPC-SP 3 (Power Tool Cleaning).
- 2.05 DESIGN AND TESTING
- A. Connection design shall be per Design Procedure outlined in Annex A of ICC-ESR 2802 or AISC 358 Chapter 12
 - B. Testing shall be performed as per ICC-ES Acceptance Criteria 129 (AC129).
 - C. Testing shall be conducted under the supervision of an independent laboratory.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Yield-Link moment connection shall be installed on structural steel beam and columns per manufacturer's instructions or Engineer's construction documents.
- B. Verify that the dimensions in the beam and column are detailed to receive the specified Yield-Link connection.

3.02 INSTALLATION

- A. Top and bottom links for each Yield-Link® connection shall have the same batch number (1st set of number noted in the link stem per Section 2.3.A.3)
- B. Thickness of spacer plates shall match the thickness of the link as shown in Table 1.1
- C. Buckling restraint plates and spacer plates shall match the Yield-Link Model per Table 1.1.
- D. All specified fasteners must be installed according to the manufacturer's instructions or Engineer's construction documents.

- E. Install all specified fasteners before loading the Yield-Link Moment Connections.
- F. Bolts connecting the Yield-Link to beam and column must be tightened in accordance with the manufacturer's installation instructions or Engineer's construction documents.
- G. Do not overload by exceeding the manufacturer's allowable load values, load values obtained from the manufacturer's software plugins and design tools.
- H. The manufacturer's patent label shall be applied adjacent to each moment connection with Yield

3.03 FIELD QUALITY CONTROL

- A. Determine that the proper part is being used in the correct application and has been fabricated by the approved manufacturer by observation of the manufacturer's patent label applied to each moment connection near the beam – to-column moment connection.
- B. Field bolting of Yield-Link Moment Connection shall be installed in accordance with the manufacturer's instructions or Engineer's construction documents.

3.04 FIELD CONNECTIONS (BOLTING)

- A. Yield-Link flange-to-column flange: Snug-tight or pretensioned
- B. Yield-Link stem-to- beam flange: Pretensioned
- C. Shear Plate-to-beam web: Snug-tight or pretensioned
- D. BRP-to-beam flange bolts: Snug-tight

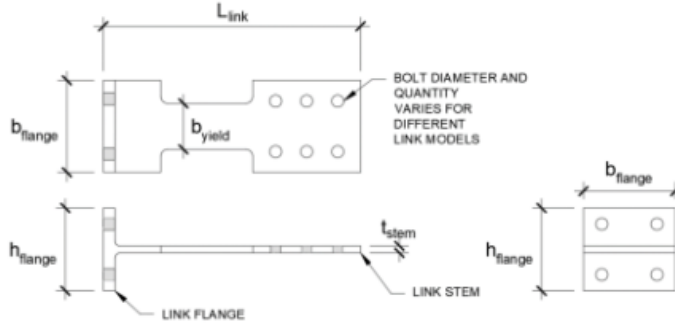
3.05 FIELD MODIFICATIONS

- A. Do not cut or enlarge the existing holes in the Yield-Link, BRP, or spacer plates.
- B. Do not weld to protected zone as indicated in ESR-2802 or AISC 358-16, Chapter 12.

3.06 REPAIRS

- A. Repairs of damaged Yield-Links, spacer plates and buckling restraint plates: All repairs shall be approved by the Structural Engineer of Record and Simpson Strong-

Table 1.1: Simpson Strong-Tie® Strong Frame® Yield-Links®



Yield-Link® ID ⁽¹⁾	Yield Link® Geometry							Design Information				BRP ID	Spacer Plate ID							
	t _{stem}	t _{flange}	b _{yield}	L _{yield}	L _{link}	b _{flange}	h _{flange}	P _{y, min}	K _{eff}	Min.	Max.									
								kip	kip/in.	Beam Depth										
YL4-2	1/2"	7/8"	2"	7"	1'-6 5/8"	6-1/4"	5-3/4"	50.0	2970	W12	W18	BRP4C	SP4C							
YL4-2.5			2.5"			6-1/2"		62.5	3468											
YL4-3			3"			7"		75.0	3960											
YL4-2.25			2.25"			7"		56.25	3337			BRP4A		SP4						
YL4-2.875			2.875"			7"		71.88	3953											
YL4-3.5			3.5"			8"		87.50	4460											
YL4-3.75			3.75"			8"		93.75	4651			BRP4B								
YL4-4			4"			8"		100.00	4831											
YL4-2.25-10		13/16"	2.25"	10"	1'-9 9/16"	7"	5-3/4"	56.25	2554	W16	W27	BRP4A-10	SP4-10							
YL4-2.875-10			2.875"			7"		71.88	3077											
YL4-3.5-10	3.5"		8"			87.50		3529												
YL4-3.75-10	3.75"		8"			93.75		3701	BRP4B-10											
YL4-4-10	4"	8"	100.00	3865																
YL6-2.5	3/4"	1-1/4"	2.5"	10"	2'-3 1/2"	6-1/2"	9-1/4"	93.75	3426	W16	W27	BRP6D	SP6D							
YL6-3			3"			8"		112.50	4149			BRP6A								
YL6-3.5			3.5"			8"		131.25	4564											
YL6-4			4"			10"		150.00	4933			BRP6B								
YL6-4.5			4.5"			10"		168.75	5801			BRP6C								
YL6-5			5"			12"		187.50	6167											
YL6-5.5			5.5"			12"		206.25	7037											
YL6-6			6"			12"		225.00	7400											
YL6-3-13			3"			8"		112.50	3484			BRP6A-13	SP6-13							
YL6-3.5-13			3.5"			8"		131.25	3868											
YL6-4-13			4"			10"		150.00	4216											
YL6-4.5-13			4.5"			10"		168.75	4925			BRP6B-13								
YL6-5-13			5"			12"		187.50	5270			BRP6C-13								
YL6-5.5-13			5.5"			12"		206.25	5981											
YL6-6-13			6"			12"		225.00	6324											
YL8-4			1"			1-13/16"		4"	13"			2'-7 1/16"	9"	10-3/4"	200.00	6034	W24	W36	BRP8A	SP8
YL8-4.5								4.5"					9"		225.00	6524				
YL8-5								5"					12"		250.00	7698				
YL8-5.5	5.5"	12"		275.00	8213		BRP8B													
YL8-6	6"	15"		2'-9 1/16"	9"		300.00	8698		W24	W36		BRP8A-15		SP8-15					
YL8-4-15	4"				9"		200.00	5465												
YL8-4.5-15	4.5"				9"		225.00	5931												
YL8-5-15	5"				12"		250.00	6959												
YL8-5.5-15	5.5"				12"		275.00	7446					BRP8B-15							
YL8-6-15	6"				12"		300.00	7908												

END OF SECTION

**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Trellis at entry.
- B. Miscellaneous shop fabricated steel items.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.
- C. Section 09 91 00 - Painting: Paint finishes.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- C. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- F. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- G. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- H. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- I. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
 - a. Include the following, as applicable:
 - 1) Design criteria.
 - 2) Engineering analysis depicting stresses and deflections.
 - 3) Member sizes and gauges.
 - 4) Details of connections.
 - 5) Support reactions.
 - 6) Bracing requirements.

1.05 QUALITY ASSURANCE

- A. Design the Trellis under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

- C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

1.06 PRODUCT DELIVERY AND STORAGE

- A. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from the elements. Store materials above the ground upon platforms, pallets, skids or other supports. Keep materials free from dirt, grease and other foreign matter, and protect from corrosion. Material showing evidence of damage will be rejected. Immediately remove rejected materials from the work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- B. Plates: ASTM A283/A283M.
- C. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- E. Shop and Touch-Up Primer complying with VOC limitations of authorities having jurisdiction.
- F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Certification of Materials: Identify all structural steel by heat or melt number and accompany with mill analysis and test reports. Furnish evidence to the Architect that the materials conform with the requirements of these specifications.
- B. Fit and shop assemble items in largest practical sections, for delivery to site.
- C. Fabricate items with joints tightly fitted and secured.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required.
- B. Prepare surfaces to be primed in accordance with SSPC-SP 2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: Two coats, color to be selected by Architect.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.04 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Field Measurements: Before starting work, secure all field measurements pertaining to or affecting the work of this section and verify the locations and exact position of all anchor bolts occurring therein.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

- A. Perform all work in accordance with the applicable provisions of the AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings," and AWS "Structural Welding Code," latest approved edition.
- B. All structural steel, both in the shop and in field shall be transported and handled and erected in such manner as will preclude any injury thereto and in no case shall the material be subjected to any undue stresses in any part of connection or member.
- C. Install items plumb and level, accurately fitted, free from distortion or defects.
- D. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed .
- G. Wall Supported Items: Attach all wall supported items by use of expansion anchors in concrete or masonry walls, and by lag bolting to adequate blocking installed in wood stud walls.
- H. After installation, touch-up field welds, scratched or damaged surfaces with primer before painting.

3.04 ERECTION TOLERANCES

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

END OF SECTION

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**SECTION 05 51 00
METAL STAIRS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.
- C. Handrails and guards.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.
- B. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal anchors in concrete.
- C. Section 04 29 00 - Unit Masonry: Placement of metal fabrications in masonry.
- D. Section 05 52 13 - Pipe and Tube Railings: Metal handrails and balusters other than specified in this section.
- E. Section 09 91 00 - Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. AISC 207 - Standard for Certification Programs; 2025.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- J. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.
- K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- L. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- M. ASTM E2072 - Standard Specification for Photoluminescent (Phosphorescent) Safety Markings; 2024.
- N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

- O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- P. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- Q. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- S. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- T. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Design Data: As required by authorities having jurisdiction.
- D. Design Data, Seismic Performance: Submit documentation that stairs meet performance requirements specified.
- E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- F. Designer's Qualification Statement.
- G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 207.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of California, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.
- C. Fabricator Qualifications:
 - 1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
 - 2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
 - 4. Dimensions: As indicated on drawings.
 - 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 - 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 - 7. Separate dissimilar metals using paint or permanent tape.

- B. Metal Jointing and Finish Quality Levels:
 - 1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
 - a. Welded Joints: Continuously welded and ground smooth and flush.
 - b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
 - c. Exposed Edges and Corners: Eased to small uniform radius.
 - d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- B. Risers: Closed.
- C. Treads: Metal pan with precast concrete tread.
 - 1. Precast Concrete Tread Thickness: 1-1/2 inches, minimum.
 - 2. Precast Concrete Treads:
 - a. Concrete Strength: 5,000 psi at 28 days, minimum.
 - b. Air Content: 4 to 6 percent.
 - c. Cement Color: Natural gray.
 - d. Abrasive Strip: Contrasting color, embedded into surface 1/2 inch back of point of nosing.
 - e. Anchorage to Tread Pan: Epoxy adhesive.
 - 3. Tread Pan Material: Steel sheet.
 - 4. Tread Pan Thickness: As required by design.
- D. Risers: Same material and thickness as tread pans.
 - 1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
 - 2. Nosing Depth: Not more than 1-1/2 inch overhang.
- E. Stringers: Rolled steel channels.
 - 1. Stringer Depth: 10 inches.
 - 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.
- G. Railings: Steel pipe railings.
- H. Finish: Shop- or factory-prime painted.
- I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.03 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
 - 1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
- B. Guards:
 - 1. Top Rails: Round pipe or tube rails unless otherwise indicated.
 - a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
 - 2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
 - a. Outside Diameter: 1 inch.
 - b. Material: Steel pipe or tube, round.
 - c. Vertical Spacing: Maximum 4 inches on center.
 - d. Jointing: Welded and ground smooth and flush.

3. End and Intermediate Posts: Same material and size as top rails.
 - a. Horizontal Spacing: As indicated on drawings.
 - b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.
- D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
 1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- E. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

2.05 ACCESSORIES

- A. Factory Fabricated Stair Tread and Nosing:
 1. Materials: Steel.
 - a. Finish: As indicated on drawings.
 - b. Color: Selected by Architect.
- B. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, and galvanized to ASTM A153/A153M where connecting galvanized components.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, and comply with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
 1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
 2. Number of Coats: One.
- D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
 1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.
- B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors and all components required for connecting stairs to structure.

- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

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

3.05 SCHEDULES

- A. Stair A: Concrete-filled pan treads and landings, with primed finish.
- B. Stair C: Bar Grate treads and landings, with primed finish.

END OF SECTION

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SECTION 05 51 33 METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop-fabricated metal ladders.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders; Current Edition.
- B. 29 CFR 1926.1053 - Ladders; Current Edition.
- C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- D. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- G. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- I. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.
- J. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- K. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Specimen warranty.
- D. Executed warranty.

1.04 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
 - 1. Manufacturer Warranty: Provide 5-year manufacturer warranty for material and workmanship. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6061 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

- E. Bolts, Nuts, and Washers: Stainless steel.
- F. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.02 FABRICATION

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

2.03 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.03 TOLERANCES

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

END OF SECTION

**SECTION 05 73 13
GLAZED METAL RAILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Railing system.
- B. Glass panels.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- J. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2022.
- K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- M. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Schedule and conduct a preinstallation meeting one week before starting work of this section. Attendees shall include, but not be limited to:
 - 1. Contractor.
 - 2. Manufacturer's representative.
 - 3. Architect.
 - 4. Other subcontractors of adjacent work.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's product data, including description of materials, components, and finishes.

- C. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor locations, transitions, and terminations.
- D. Samples: Submit one of each item below for each type and condition shown:
 - 1. Glass: 12 inches by 12 inches, showing color, thickness, and edge condition.
 - 2. Railing: 12-inch long section of handrail showing color, finish, and connection detail.
- E. Manufacturer's qualification statement.
- F. Single-source qualification statement.
- G. Installer's qualification statement.
- H. Maintenance Data: Manufacturer's instructions for care and cleaning.
- I. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with no less than 20 years of documented experience.
- B. Installer Qualifications: Factory authorized subcontract installer.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Provide one panel, full-height mock-up of railing system including glass, indicating each type of material, cladding, and finish.
- C. Locate where directed.
- D. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver materials in factory-provided protective coverings and packaging.
- C. Protect materials against damage during transit, delivery, storage, and installation at site.
- D. Inspect materials upon delivery for damage. Replace damaged items.
- E. Keep materials in original packaging until installation.
- F. Prior to installation, store materials and components under cover in dry location.

1.08 FIELD CONDITIONS

- A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.
- B. Maintain ambient temperature of space at minimum 65 degrees F and maximum 95 degrees F for 24 hours before, during, and after railing installation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer's Warranty: Manufacturer's standard 1-year warranty against defects in materials, fabrication, finishes, and installation commencing on mm-dd-yyyy. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Basis of Design: HDI Railing Systems: www.handrail-design.com/#sle, or equal.
- B. Substitutions: See Section 01 60 00 - Product Requirements and Section 01 25 00 Substitution Procedures.

- C. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 RAILING SYSTEMS, GENERAL

- A. Factory- or shop-fabricate to suit project conditions, for proper connection to building structure, and in largest practical sizes for delivery to site.
- B. Handrails: Comply with applicable accessibility requirements of ADA Standards.
- C. Joints: Tightly fitted and secured, machined smooth with hairline seams.
- D. Field Connections: Provide sleeves, anchors, and other devices required for site assembly and installation.
- E. Welded Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.

2.03 STRUCTURAL GLASS RAILINGS

- A. Base-Mounted: Engineered, continuous base-shoe-supported railing system with structural glass.
 - 1. Product: HDI Railing Systems; Optik Shoe: www.handrail-design.com/#sle.
 - 2. Top Rail: Round, stainless steel, 1-1/2-inch diameter.
 - 3. Top Rail: Cap rail.
 - 4. Grip Rail: Round, stainless steel, 1-1/2 inch diameter.
 - 5. Handrail Brackets: Metal and finish to match railing.
 - 6. Base Channel: Aluminum, finish to match railing.
 - 7. Glass: As specified in this section.
 - 8. Fasteners: Concealed.

2.04 MATERIALS AND FINISHES

- A. Aluminum Components: ASTM B221 or ASTM B221M.
- B. Steel Components:
 - 1. Sections, Shapes, Plates, and Bars: ASTM A36/A36M.
 - 2. Tubing: ASTM A501/A501M structural tubing; round, and shapes as indicated.
 - 3. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
 - 4. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
 - 5. Powder Coat Finish: Manufacturer's recommended system.
 - a. Color selected by Architect from Manufacturer's standard colors.
- C. Glass:
 - 1. Fully Tempered Safety Glass: ASTM C1048; Kind FT, Condition A, Type 1, transparent, Class 1, Quality Q3, unless otherwise indicated.
 - a. Plastic Interlayer: SGP, 0.060-inch thick.
 - b. Impact Strength: Category II, tested in accordance with 16 CFR 1201.
 - c. Thickness: 3/8 inch.
 - d. Configuration: As indicated on drawings.
 - e. Edges: Ground smooth and polished.
 - f. Finish: Plain, no finish.
 - g. Color: Clear, no tint.

2.05 ACCESSORIES

- A. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated.
 - 1. For anchorage to concrete, provide anchors capable of sustaining, without failure, a load equal to four times the load imposed when installed in concrete, tested in accordance with ASTM E488/E488M. Provide inserts to cast into concrete for bolt anchors.

2. For anchorage to structural steel, provide 24-inch center-to-center hole spacing; 1/2-inch, stainless steel, socket head cap screws for drilled and tapped or drilled and bolted attachment; provide anchors capable of sustaining, without failure, a load equal to four times the load imposed on the assembly.
 3. For anchorage to masonry, provide brackets to embed in masonry for bolt anchors.
 4. For anchorage to stud walls, provide backing plates for bolt anchors.
- B. Finish Touch-Up Materials: As recommended by manufacturer for field application.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, comply with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions of locations and areas to receive work.
- C. Verify anchoring devices and reinforcement are correct type, located correctly, and installed correctly.
- D. Notify Architect immediately of conditions that would prevent satisfactory installation.
- E. Do not proceed with work until detrimental conditions have been corrected.
- F. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates, and supports for attachment of anchors.

3.02 PREPARATION

- A. Protect existing work.
- B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions, and directions for installation of anchorages and fasteners.
- C. Clean surfaces to receive units. Remove materials and substances detrimental to installation.

3.03 INSTALLATION

- A. Use manufacturer's approved installer.
- B. Comply with manufacturer's drawings and written instructions.
- C. Install components plumb and level, accurately fitted, free from distortion or defects, and with tight joints, except where necessary for expansion.
- D. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Anchor securely to structure.
- F. Conceal anchor bolts and screws whenever possible.
- G. Weld connections that cannot be shop-welded due to size limitations.
 1. Weld in accordance with AWS D1.1/D1.1M.
 2. Field-welding by certified welder.
 3. Match shop-welding and bolting.
 4. Clean welds, bolted connections, and abraded areas.
 5. Touch up shop primer and factory-applied finishes.
 6. Repair galvanizing with galvanizing repair paint in accordance with ASTM A780/A780M.
- H. Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch.
- B. Maximum Offset from True Alignment: 1/4 inch per 50 feet of railing, noncumulative.

- C. Maximum Out-of-Position: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Field Services: Provide services of manufacturer for field observation of installation of railings.

3.06 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove manufacturer's protective coverings after installation.
- C. Metal: Clean exposed metal finishes with cloth moistened with potable water, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents, or other substances that may damage material or finish.
- D. Glass and Glazing: Clean glazing surfaces; remove excess glazing sealant compounds, dirt, and other substances.

3.07 PROTECTION

- A. Protect installed products from damage until Project completion.
- B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
 - 1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: All labor, materials and equipment and all operations required to complete all rough carpentry and structural framing as indicated on the drawings; to produce shapes and configurations as shown, as required; and as specified herein, including:
1. Structural floor, wall, and roof framing.
 2. Floor, wall, and roof sheathing.
 3. Rough hardware, framing connectors and fasteners.
 4. Treatment of wood.
 5. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, wood trim, and other work requiring supporting blocking.
 6. Miscellaneous wood nailers and furring strips, including roof applications, other wood framing, furring, shims or blocking as required to complete the work.
- B. Related Sections:
1. Pertinent sections of Division 01 specifying Quality Control and Testing Agency services.
 2. Pertinent sections of Division 01 specifying Structural Product Requirements: Structural Product Options, Substitution procedures and limitations, transportation, handling and storage.
 3. Pertinent sections of Division 03 specifying wood formwork construction and/or setting anchors in concrete.
 4. Pertinent section of Division 06 specifying wood construction and materials.
 5. Pertinent sections of other divisions specifying steel or concrete construction.

1.02 REFERENCES

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 23 Wood.
- B. American National Standards Institute (ANSI) / American Wood Council (AWC) "NDS - National Design Specification for Wood Construction".
- C. National Institute of Standards and Technology (NIST) / Engineered Wood Association (APA) "PS 1 - Voluntary Product Standard for Structural Plywood".
- D. NIST / APA "PS 2 - Performance Standard for Wood-Based Structural-Use Panels".

- E. NIST "PS 20 - American Softwood Lumber Standard".
- F. Redwood Inspection Bureau (RIS) "Standard Specifications for Grades of California Redwood Lumber".
- G. West Coast Lumber Inspection Bureau (WCLIB) "Standard Grading Rules for West Coast Lumber No. 17".
- H. Western Wood Products Association (WWPA) "Western Lumber Grading Rules".
- I. American Wood Preservers Association (AWPA) "Book of Standards".

1.03 SUBMITTALS

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. Submit for review prior to fabrication. Submittals that do not meet these requirements will be returned for correction without review.
 - 1. Substitutions for products specified require conformance to substitution requirements in Division 01.
 - 2. Review of materials and hardware for substitution to products specified is at the additional expense of the Contractor.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer.
- C. Product Data:
 - 1. Submit manufacturer's product data, specifications, and installation instructions for & location of framing connectors, wood preservative materials, application instructions, and fasteners. Include complete, accurate equivalence data when submitting alternate products to those specified. Provide samples of these items upon request.
 - 2. Submit product data and current ICC-ES report for machine-driven nails, fasteners, and equipment, including dimensions of all fasteners, including head, shank diameter and length.
- D. Shop drawings: For manufactured wood products, submit each building as a complete unit. Do not mix components from multiple buildings or units of work in a submittal. Include all of the following;
 - 1. Indicate profiles, sizes, and spacing locations of structural members.
 - 2. Cross-reference all shop drawing detail references to contract document detail references.
 - 3. Secure all field measurements as necessary to complete this work.
- E. Manufacturer's Certificate: Submit all certifications of physical and chemical properties of materials as specified below in Article titled QUALITY ASSURANCE.

1. Certify that wood products supplied for rough carpentry meet or exceed specified requirements, including specified moisture content.

1.04 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies, refer to pertinent sections of Division 01 and CBC Chapter 17.
- B. All tests shall be performed by a recognized testing agency as specified in pertinent sections of Division 01.
- C. Inspection of fabricators is required per CBC 1704.2.5 unless fabricator is registered and approved by the building official. Wood product quality standards:
 1. All wood products to comply with article REFERENCES.
 2. Factory-mark each piece of lumber and sheathing with type, grade, mill, and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.
 3. Sheathing panels to be marked by APA (The Engineered Wood Association).
- D. End-Jointed lumber shall not be used.
- E. Hardware and engineered wood products shall have current ICC ES Evaluation/research reports that are equivalent to products specified.
- F. Employ competent workers experienced in work of the types specified and required.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent requirements of Division 01.
- B. Delivery: Time delivery and installation of carpentry products to avoid delaying other trades whose work is dependent on or affected by this section and to comply with moisture content, protection and storage requirements.
- C. Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and sheathing panels to prevent deformation and provide air circulation within stacks.
 1. Store materials for which a maximum moisture content is specified only in areas where relative humidity has been reduced to a level where specified moisture content can be maintained.
 2. Handle and store materials above ground to prevent damage, contamination, or accumulation of dirt or foreign materials.
 3. Provide special protection for horizontal sheathing panels. Deformation of panels due to moisture is not acceptable.

1.06 PROJECT/SITE CONDITIONS

- A. Verify all conditions at project site affecting the work; work to field dimensions as required. Coordinate carpentry installation with size, location, and installation of service utilities.
- B. Sequence rough carpentry installation activities to allow sufficient time for:
 - 1. Review of all submittals.
 - 2. Indicate submittal review, procurement, and testing activities in the project schedule prior to the start of installation. Installation durations shall be based on hand-nailed installation methods specified.
 - 3. Attainment of specified maximum lumber moisture content.

PART 2 - PRODUCTS

2.01 DIMENSIONED LUMBER

- A. General
 - 1. Size per industry standards for nominal sizes shown; S4S (sanded four sides).
 - 2. Warped/twisted and excessively checked members shall not be used regardless of grade marks.
 - 3. At the Contractor's option, engineered lumber of equivalent size and material properties may be substituted for solid sawn lumber where material is difficult to source due to length, availability, etc. Submit proposed substitution to Engineer for review prior to purchasing materials.
- B. Moisture content of framing:
 - 1. All sawn lumber to be maximum 19% at time of fastener installation and at time of close-in, unless noted otherwise.
 - 2. The Owner's Testing Laboratory will test for moisture content prior to commencement of close-in.
 - 3. The Contractor shall recognize that excessive shrinkage of lumber results from excess moisture content at the time of installation. The Contractor will compensate for use of such lumber by waiting for acceptable moisture content before close in and/or by replacing/repairing lumber that has sagged, twisted, or warped prior to close in.
 - 4. Deviation from this specification would require structural redesign of connections and fasteners.
- C. Sills/ledgers on concrete or masonry: No. 2 pressure treated Douglas Fir and as called for on the drawings.
- D. Interior structural framing shall be Douglas Fir (D.F.) with grades as noted below, unless otherwise specified on the drawings. All grades are per WCLIB standard grading rules.
 - 1. All permanently exposed (interior or protected from weather) framing shall be select structural grade with no box heart.

2. Except per 1 above, unless noted otherwise, minimum grades are:
 - a. Floor/roof joists/rafters (2x) and 2x8 & larger studs: D.F. No. 2
 - b. 2x4 and 2x6 studs and plates: D.F. No. 2
 - c. 4x and larger: D.F. No. 1
 - d. Blocking: D.F. No. 2
 - e. 6x8 and larger posts and beams may be SGL/CGL per below unless noted otherwise on the drawings.
- E. Exterior structural framing (exposed to weather) shall be redwood select structural grade or pressure treated D.F. No. 1, unless noted otherwise.
- F. Structural decking shall be D.F. select decking or White Pine select where not exposed to moisture. Where directly exposed to moisture or high humidity for prolonged periods of time, decking shall be Alaskan Yellow Cedar or Port Orford Cedar. Moisture content at time of installation to be less than 12%.
- G. Framing not otherwise shown or specified: Douglas Fir construction grade per WCLIB paragraphs applicable to uses and sizes required.

2.02 MANUFACTURED LUMBER

- A. All engineered lumber to be maximum 16% at time of fastener installation and at time of close-in, unless noted otherwise.
- B. Structural (Certified) Glued Lumber (SGL): SGL shall be manufactured following the American Lumber Standards Committee (ALSC) "Glued Lumber Policy" and meet the requirements of Voluntary Product Standard PS 20 "American Softwood Lumber Standard". Grading shall be per the West Coast Lumber Inspection Bureau (WCLIB) or Western Wood Products Association (WWPA). SGL shall be manufactured with waterproof adhesive. "Stud use only" SGL is not permitted.
 1. Acceptable products:
 - a. "RMT" by Rosboro.
 - b. Approved equal.
 2. Where specified for use on plan, SGL shall be entirely Douglas Fir lumber. SGL shall be grademarked to match the grade as would be specified for solid sawn lumber in the same location/use.
 3. At the contractor's option, SGL may be substituted for solid sawn lumber. SGL species and grade shall match that for the solid sawn member. SGL shall not be substituted for glued-laminated (glulam) members.
- C. Laminated Veneer Lumber (LVL): for use as joists, beams, blocking, or studs when so noted on the drawings. Conform to ICC AC 47. Minimum $F_b = 2,600$ PSI. Minimum $E=2,000,000$ PSI. Acceptable products:
 1. "Microllam LVL" by Trus Joist, ICC ESR-1387
 2. "Redlam LVL" by RedBuilt, ICC ESR-2993
 3. Approved equal

- D. Laminated Strand Lumber (LSL): for use as blocking (flat or vertical) or rim joist when used with I-joist or LVL, when so noted on the drawings. Conform to ICC AC 124. Minimum $F_b = 1,700$ PSI. Minimum $E = 1,300,000$ PSI. Acceptable products:
1. "Timberstrand LSL" by Trus Joist, ICC ESR-1387
 2. "Redlam LSL" by Redbuilt, ICC ESR-1387
 3. Approved equal
- E. Parallel Strand Lumber (PSL): for use as beams and posts when so noted on the drawings. Conform to ICC AC 47. Minimum material properties for beams: $E = 2,200,000$ psi; $F_b = 2,900$ psi; $F_c = 2,900$ psi (parallel); $F_v = 290$ psi. Minimum material properties for posts: $E = 1,800,000$ psi; $F_b = 2,400$ psi; $F_c = 2,500$ psi (parallel); $F_v = 190$ psi. Acceptable products:
1. "Parallam PSL" by Trus Joist, ICC ESR-1387
 2. Approved equal

2.03 STRUCTURAL SHEATHING PANELS

- A. All sheathing to be maximum 16% at time of fastener installation and at time of close-in, unless noted otherwise.
- B. Plywood: Structural sheathing shall conform to product standard PS-1 or PS-2. All panels shall have a minimum bond classification of "Exposure 1" and bear the trademark of the Engineered Wood Association (APA) or other qualified agency. Grades shall be "Rated Sheathing" or "Structural 1" as required on the drawings.
- C. Oriented Strand Board (OSB): All structural OSB shall be grade marked by a qualified agency for conformance with Product Standard PS-2 and shall be fabricated with exterior glue. Grades shall be as required on the drawings.

2.04 TREATED WOOD:

- A. Treated Lumber and Plywood: Comply with requirements of AWPA Standard U1. See Standard U1 for "Use Category" designations. Do not provide higher Use Category lumber than that specified. Maximum moisture content shall be the same as required above for respective product type.
- B. Preservative Treated Lumber
1. General
 - a. Preservatives shall be waterborne. Preservative retention rate shall be as required per AWPA Standards U1 & T1. Lumber shall be Douglas Fir No. 2 (or better). Cut faces of treated wood shall be brush treated (two complete applications) prior to installation.
 - b. Lumber less than 8 inches above grade and lumber less than 6 inches above exterior hard-surface flatwork shall be treated.
 - c. Each piece of wood shall be stamped by the wood preservative applicator to identify its treatment and preservative retention.
 2. Lumber at interior, non-weather exposed locations installed adjacent to concrete or masonry shall be Use Category UC2. Examples include sill plates & ledgers

and lumber in contact with roofing, flashing, or water proofing. Borate treated lumber meeting AWPA UC2 is acceptable in this application.

3. Lumber at exterior locations, not in contact with soil/ground, shall be Use Category UC3B. Examples include Douglas Fir decking and deck framing.
 4. Lumber in contact with soil/ground shall be Use Category UC4A. Examples include timber retaining walls.
 5. Poles, posts, and sheathing panels shall be treated as recommended by AWPA Standard U1 per use and exposure.
 6. Maximum Volatile Organic Compound (VOC) content of field-applied preservative shall meet local air quality standards and the California Green Building Code. Provide either of the following:
 - a. Copper Azole (CA-B) per ICC-ES AC326.
 - b. Alkaline/Copper/Quaternary (ACQ).
- C. Fire Retardant Treatment: Product and application process must be recommended by manufacturer of treatment as being suitable for painting. Application shall be by a California State Fire Marshal approved licensed contractor.
1. Exterior Type: Use Category UCFB, chemically treated, and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Treat exposed exterior rough carpentry items, including stairways, balconies, and covered walkways.
 - b. Do not use treated wood in direct contact with the ground.
 2. Interior Type: Use Category UCFA, low temperature (low hygroscopic) type, chemically treated, and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Treat rough carpentry items as indicated.
 - b. Do not use treated wood in applications exposed to weather or where the wood may become wet.

2.05 FASTENERS AND ACCESSORIES

- A. General requirements for fasteners:
1. Fasteners shall be of adequate size, spacing, and number to resist design loads under intended use, and types shall be appropriate for the materials or conditions for which used.
 2. Provide washers, pre-drilling, etc. as required for proper installation and to prevent damage to framing.
 3. Fasteners shall be hot-dip galvanized (ASTM A153), mechanically galvanized (ASTM B695 class 55 minimum), stainless steel (type 303, 304, 305, or 316), silicon bronze, or copper by approved methods for the following applications:
 - a. Exterior, exposed use.

- b. In contact with preservative or fire-retardant treated wood.
 - c. Nails in contact with preservative treated wood containing ammonia shall be stainless steel.
- 4. Fasteners in moist corrosive atmosphere to be of stainless steel (type 303, 304, 305, or 316).
- 5. Where the retention level of ACQ or MCQ preservative is greater than 0.40 pcf, CBA-A preservative is greater than 0.41 pcf, or CA-B preservative is greater than 0.21 pcf, provide stainless steel fasteners (type 303, 304, 305, or 316).
- 6. All fasteners specified by manufacturer shall be installed in framing hardware, unless noted otherwise.
- 7. At borate treated lumber a clear zinc coating per ASTM F1941 is acceptable.
- B. Nails and nailing not otherwise shown or specified:
 - 1. Comply with requirements of governing building code.
 - 2. For securing materials to hardened concrete or masonry provide hardened steel masonry nails or Simpson Strong-Tie "Titen" screws.
 - 3. For framing and general woodworking: Common bright wire nails (not box nails) with centered full-round heads per ASTM F1667 including Supplement S1. 16d cement coated sinker nails may be used in lieu of common nails for framing, where noted on the drawings. Unless otherwise noted on drawings, nail sizes shall be as follows
 - a. 8d Common: 0.131"Ø x 2-1/2" long with 0.281"Ø head.
 - b. 10d Common: 0.148"Ø x 3" long with 0.312"Ø head.
 - c. 16d Common: 0.162"Ø x 3-1/2" long with 0.344"Ø head.
 - 4. Nails for sheathing panels shall be of common wire with full round heads and shall be of sufficient length to fully develop the nails.
 - 5. Machine-driven nails of all types must comply with the requirements of this section. All proposed nails shall match diameter and penetration of specified nails.
 - 6. Staples shall conform to length and gauges specified and shall be installed to match specified patterns and spacing.
 - 7. Power Actuated Fasteners (PAF): Use only as approved by the Architect/Engineer; operators shall be qualified.
- C. Bolts: Malleable iron washers or steel plate washers, unless otherwise shown, shall be provided under all bolt heads and nuts.
 - 1. Machine Bolts: ASTM A307 and ANSI/ASME B18.2.1, standard semi-finished machine bolts as shown or required. Nuts shall be standard size unless noted otherwise and shall be per ASTM A563.
 - 2. Anchor bolts or threaded rod anchors shall conform to ASTM F1554, ASTM A307, or ASTM A36. Anchor bolts shall be headed or end in two nuts tightened

against one another, unless noted otherwise. Provide embedded plate washer as indicated on drawings. No upset threads allowed. No L or J bolts allowed.

- D. Lag screws: Standard hex lag screws per ANSI/ASME B18.2.1.
- E. Wood screws: Standard wood screws per ANSI/ASME B18.6.1.
- F. Power Actuated Fasteners (PAF): Hilti X-CP72, ICC ESR-2379; Simpson PDPAWL-300 MG, ICC ESR-2138.
- G. Framing hardware: Fabricated sheet metal timber framing connectors shall be manufactured from painted or galvanized G90 steel by Simpson Strong-Tie (connectors specified on drawings are per Simpson Strong Tie, or approved equivalent. Connectors shall be at least 16 gauge material, (1/8 inch plate materials where welded), unless otherwise noted, punched for nailing. All heavy hardware to be fabricated from A36 steel per Division 05, Metals. All hardware intended for exterior exposed use shall be galvanized per G185 ASTM A653 or stainless steel.
 - 1. For contact with preservative or fire-retardant treated wood, provide minimum G185 galvanizing per ASTM A653.
 - 2. Nails and nailing shall conform to the manufacturer's instructions with a nail provided for each punched hole. Nails to be used with framing accessories are subject to the requirements specified in this Section for fasteners and anchors.
- H. Subfloor Glue: Water proof, water base, air cure type, cartridge dispensed conforming to APA Standard AFG-01 or ASTM D3498. Maximum Volatile Organic Compound (VOC) shall meet local air quality standards and the California Green Building Code.

2.06 SOURCE QUALITY CONTROL

- A. The Testing Agency, as specified in the Article QUALITY ASSURANCE, will perform testing for moisture content of all lumber at time of fastener installation.
- B. The Testing Agency will submit reports as specified in Division 01.

PART 3 - EXECUTION

3.01 REQUIREMENTS FOR STRUCTURAL FRAMING

- A. General
 - 1. Refer to drawings for layouts, notes and details, provide framing as required; comply with governing building code requirements.
 - 2. Provide framing to achieve true alignments as surfaces receiving finish materials.
 - 3. It shall be the responsibility of the Contractor to provide and install all wood blocking, furring strips, or grounds detailed or required to provide anchorage for all finishes, accessories, fixtures, etc. as required to complete all work. All blocking and/or backing shall be securely bolted or otherwise anchored in place.
 - 4. Contractor shall be responsible for layout of anchor bolts, and other hardware embedded in concrete when placed by other trades.

5. Provide and install all structural framing, blocking, fasteners, brackets, clips, etc. as required to complete work specified in the Construction Documents.

B. Framing

1. Sill Plates and Ledgers:

- a. Sill plates and ledgers on concrete shall be anchored with bolts, unless noted otherwise, shall have full bearing on concrete, and shall be placed for sheathing panel nailing as indicated. All bolt nuts shall be provided with a cut plate steel washer for bearing on wood.
- b. Provide a minimum of two sill anchor bolts per sill piece with a bolt no less than 4 ½" and no more than 12" from the end of the sill. Bolts to be 5/8" diameter x 12" (18" at curb) long at 48" on centers, unless otherwise shown or noted. Provide additional anchor bolts each side of a notch or hole, as per a typical plate splice, where notch or hole is in excess of 1/3 the plate width. At shear walls, provide a plate washer 3" x 3" x 0.229" minimum between the sill and nut at anchor bolts. Plate washer to extend within ½ inch of the structural wall sheathing. Offset and/or stagger anchor bolts, or provide larger plate washer as required.
- c. Anchor bolt holes in sill plates or ledgers shall be 1/16" maximum larger than anchor bolt.

2. Stud Walls and Framing:

- a. Cut studs and posts with square ends, unless otherwise shown or noted. All posts and beams shall be "cut to bear" unless otherwise detailed.
- b. All studs in walls shall be placed with the shortest dimension parallel to the run of the wall. Bearing studs shall extend full height to be the supporting framing as shown; non-bearing studs shall extend to the supporting framing.
- c. Provide double studs on each side of all openings, unless shown or noted otherwise.
- d. All openings in stud walls and partitions shall be framed with headers across the top, as shown, with a minimum size (6" nominal depth x stud width) resting on short cripple studs, and as shown on the drawings.
- e. All stud partitions and walls shall have horizontal solid blocking not less than 2x and of the same width as the stud, fitted and nailed into the studs at mid-height of stud, for studs over 8 feet in height, except as otherwise shown or specified. This blocking shall be so spaced that there shall be no concealed air spaces greater than eight feet in any dimension.
- f. Stud partitions containing plumbing, heating or other pipes shall be so framed as to give proper clearance for piping. Plumbing, heating and vent pipes exceeding 1-1/2" in inside diameter shall not be placed in partitions used as bearing or shear walls unless completely furred clear of the wall. No notching shall be allowed. Pipes shall be placed in the center of the plate using a neat bored hole and the plates shall be strapped on each side with 3" x 36" x 14 gauge steel punched for 10d nails 3" on center, staggered, or as shown on the drawings.

3. Top Plates

- a. Top plates shall be double, set single. Corners where stud wall or partitions meet shall be framed with studs on all surfaces and blocking to form a "rigid" corner with nailing for all corners. Double top plates shall be lapped at corners. Lap splices and nailing per the drawings.

4. Floor, Roof and Ceiling Framing
 - a. Joists and beams shall be accurately aligned and the position and spacing of all joists and beams shall be as shown and be coordinated with other framing and to other trades prior to actual construction.
 - b. Place all joists and beams with crown up. Cantilevered joists and beams shall be placed with the crown down.
 - c. Cutting of wood girders, beams or joists for electrical and mechanical lines shall be limited to cuts and bored holes not deeper than 1/5 of the beam depth from the top and located not farther from the support than three times the beam depth and not less than the beam depth. Cuts in excess of this, or single bored holes with a diameter of more than 1" are not permitted without special provisions for framing the beams. Location of all cuts in framing shall receive the prior review of the Architect/Engineer.
 - d. Provide vent holes in rafters and/or blocking as shown and/or directed by the Architect.

3.02 STRUCTURAL SHEATHING

A. General

1. Sheathing nailing shall be as required on the drawings. Do not overdrive (Do not break skin of sheathing face sheet). Over driving will be cause for rejection.
2. Form sheathing may be re-used for concealed sheathing provided the lumber at the time of re-use is approved by the Architect, meets with the framing grade requirements specified herein, is in good condition, and is thoroughly cleaned with all nails removed.
3. Pneumatic nailing devices shall be adjustable so that nail heads do not penetrate skin of sheathing. Contractor shall submit equipment and nails for review prior to use. Refer to PART 2 for other nailing requirements.

B. Roof and Floor Sheathing: Except "Panelized Roofs", lay with face grain perpendicular to roof rafters, roof trusses or floor joists. Stagger sheets. Block all unsupported sheet edges with 2x material unless noted otherwise.

C. Wall Sheathing: Lay with face grain either parallel or perpendicular to studs. Exposed bottom edges shall be sealed as recommended by manufacturer. Block all unsupported sheet edges with 2x materials unless noted otherwise.

D. Panelized Roofs: Where sheathing is set @ 8'-0 1/8" spacing, cut every fourth sheet short by 1/2" to re-align structural framing that has been specified to be spaced at even units of 2, 4 or 8 feet.

3.03 ROUGH HARDWARE

A. General: Nails, spikes, screws, fabricated sheet metal anchors, ties, hangers and any other materials shown or required for the attachment of wood to concrete and wood to steel and wood to wood shall be furnished and installed as part of this work.

B. Framing Nailing: All framing nailing shall conform to minimum requirements of the Building Code, and with details shown on the drawing.

C. Bolts, Lag Screws and Washers:

1. Bolts in wood shall be machine bolts unless otherwise noted and shall be of such length that the bearing length of the threads does not exceed $\frac{1}{4}$ of the full bearing length in the member holding the threads. Bolt holes in wood shall be $\frac{1}{32}$ " oversized. Bolt holes for sill plates may be $\frac{1}{16}$ " maximum oversize. Holes in steel shall be $\frac{1}{16}$ " oversize. See Section 3.1 for anchor bolts at sill plates and ledgers.
 2. Provide square plate or malleable iron washer and nut at head where bearing is against wood; cut washer under nut where it is against steel. Washer will not be required under head of carriage bolts. Provide malleable iron washers where exposed.
 3. All nuts shall be tightened when placed and retightened at completion of the job or immediately before closing with final construction.
 4. Lag screws shall be screwed (not driven) into place. Drill pilot hole to 70% of shank diameter. Drill clearance hole to full shank diameter and depth of unthreaded screw length.
- D. Wood Screws: Minimum penetration is 10 diameters unless noted otherwise. Where fastening hardwood timber species or where wood tends to split, provide pilot hole 70% of screw shank diameter.
- E. Proprietary Fasteners and Hardware: Install per manufacturer's published installation instructions (MPII) and code approval report (e.g. ICC ESR, IAPMO ER, etc). Provide MAX quantity, size, and length of fastener at hardware (i.e. joist hangers, framing, clips, etc) unless otherwise noted per plan.

3.04 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

- A. Coordinate installation of wood decking, metal-web wood joists, glued-laminated wood construction, shop-fabricated wood trusses, and wood I- joists.
- B. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members. Fasten curbs corner-to-corner and to rafters with framing connectors configured for this application.
- C. Blocking:
1. Provide fire blocking at locations and spacing's as required by CBC Chapter 7. Locate other blocking, supplementary framing, backing plates and bracing to facilitate installation of finish materials, fixtures, equipment, services, accessories, and trim requiring attachment and support.
 2. Solid block joists and rafters over all supports with blocking of the same size and material as the joist or rafter.
- D. Furring:
1. Nominal 1 inch x 3 inch minimum, continuous and spaced at 16 inches on center, maximum.
 2. Install plumb, rigid, and level. Shim where necessary to provide a true, even plane suitable to receive the finish required.

- 3. Attach to concrete and masonry as shown in the contract drawings.
- E. Bridging: Use 2 inch solid cross bridging. Nail bottom ends of bridging only after sheathing has been nailed.
- F. Stair Framing: Provide with 3 stair stringers for each set of stairs, unless otherwise shown. Cut notches to receive exact size of treads and risers (if any) shown, with no change in dimensions between landings. Provide stringers of size shown, or if not shown, of a size to allow not less than 3-1/2 inch of effective depth, measured perpendicular to the rake of the stringer, after notching.
- G. Install miscellaneous metal angles, bolts, and other items; secure into formwork where embedded in concrete.
- H. Install accessory items not otherwise set under other sections; after completion of painting and other finishing work; in locations shown or directed by the Architect. Set items plumb, level, and secure using appropriate fastening as applicable.

3.05 FIELD APPLIED WOOD TREATMENT

- A. Field treat all end cuts and holes in preservative treated materials per PART 2.
- B. Apply two brush coats; or full-immersion dip not less than 15 minutes; or as required to thoroughly saturate all surfaces after cutting.
- C. Air dry 2-hours minimum before installation.

3.06 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum. Provide framed substrates meeting requirements for application of finishes specified in other sections.
- D. Exposed surfaces shall be free from dents and tool marks, unsanded rough or torn faces and corners, and other defects.

3.07 FIELD QUALITY CONTROL

- A. The Testing Agency, as specified in the Article QUALITY ASSURANCE, will perform the following tests and submit reports as specified in Division 01:
 - 1. Moisture content of all lumber at time of close-in.
 - 2. Periodic special inspection of nailing, bolting, and other fastening within the seismic-force-resisting system including shear walls, wood diaphragms, etc. per CBC Section 1705.13.2, excluding systems with sheathing nailing spacing greater than 4" on center.

3. Special inspection of high load diaphragms per CBC Section 1705.5.1 where designated on documents.

3.08 ADJUSTING

- A. Replace all defective work at Contractor's expense.
- B. Replace defective or damaged work with conforming work.
- C. Correct defects using means that will not injure the materials.
- D. Replace defective or damaged work which cannot be corrected in the field with new work, or return defective items to the shop for repair.
- E. Repair or replace framing lumber sagged, twisted or warped due to shrinkage from excessive moisture content at time of installation, or from other causes.
- F. Adjust to meet specified tolerances.
- G. Architect/Engineer shall review all proposals for the repair or replacement of damaged, defective, or missing work.
- H. Pay expenses incurred by Owner for Architect/Engineer's costs for (re-)design and obtaining approvals of Authorities Having Jurisdiction (AHJ) necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work.
- I. Pay expenses due to re-testing and re-inspection necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work.

3.09 CLEANING AND PROTECTION

- A. Clean all surfaces upon completion of erection, leave free of grime and dirt. Remove unused materials, tools, equipment, and debris from the premises and leave surfaces broomed clean.
- B. Waste Disposal: Comply with the requirements of pertinent sections of Division 01 specifying cleaning and disposal.
 1. Comply with applicable regulations.
 2. Do not burn scrap on project site.
 3. Do not burn scraps that have been pressure treated.
 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- C. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- D. Prevent sawdust and wood shavings from entering the storm drainage system.
- E. Protect work from damage by subsequent operations.

END OF SECTION

**SECTION 06 20 00
FINISH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood door frames, glazed frames.
- C. Wood casings and moldings.
- D. Cedar liner panels for lockers.
- E. Wood Veneer panels.
- F. Trellis at entry.

1.02 RELATED SECTIONS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 06 41 13 - Wood-Veneer-Faced Architectural Cabinets: Custom cabinet work.
- D. Section 08 14 16 - Flush Wood Doors.
- E. Section 09 91 23 - Interior Painting: Painting of finished carpentry items.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).
- B. ANSI A208.1 - American National Standard for Particleboard; 2022.
- C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- G. BHMA A156.9 - Cabinet Hardware; 2020.
- H. PS 1 - Structural Plywood; 2023.
- I. Comply with the Woodwork Institute (WI) Manual of Millwork for the grades specified.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Interior Woodwork Items:
 - 1. Moldings, Bases, Casings, and Miscellaneous Trim: per the Finish Schedule in the drawings.
 - 2. Loose Shelving: Birch plywood; prepare for paint finish.
 - 3. Cedar Liners for Lockers: "Cedar Classic" 1/4" panel on interior back side of locker.
 - 4. Veneer panels for walls and custom fabrications.
- B. Exterior Items:
 - 1. Wood trellis at main entry.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Provide sustainably harvested wood, certified or labeled; see Section 01 60 00.
- B. Provide composite wood products complying with composite wood indoor emission requirements in Section 01 35 10.

2.03 LUMBER MATERIALS

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Newport Beach, California

02/05/2026
FINISH CARPENTRY
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- A. Interior Softwood Lumber: Clear Fir, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
 - 1. Grading: In accordance with rules certified by ALSC; www.alsc.org.
- B. Exterior Lumber: Alaskan Yellow Cedar

2.04 SHEET MATERIALS

- A. White Birch veneer panels, rotary sawn, Grade A, locate per the drawings.
- B. White Oak veneer panels, rotary sawn, Grade A, locate per the drawings.
- C. Aromatic Cedar Panels, smooth, unfinished, for lining lockers.
- D. Wood Tambour Panels:
 - 1. Manufacturer: Solid Surfacing Profile 493, or equal.
- E. Wood Beadboard Panels.
- F. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
- G. Particleboard: ANSI A208.1 Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.
- H. Hardboard: ANSI A135.4 Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side (S1S).

2.05 FASTENINGS

- A. Fasteners for Exterior Applications: Stainless steel; length required to penetrate wood substrate 1-1/2 inch minimum.
- B. Concealed Joint Fasteners: Threaded steel.
- C. Metal Z-Shaped Support Clips: Paired, cleated, structural anchorage components applied to back of finish carpentry items and walls for mounting.
 - 1. Material: Extruded aluminum.
 - 2. Products: Eagle Aluminum; Eagle Z-Clips: www.eagle-aluminum.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Primer: Alkyd primer sealer.
- C. Wood Filler: Oil base, tinted to match surface finish color.

2.07 HARDWARE

- A. Hardware: Comply with BHMA A156.9.
- B. Shelf Standards: Zinc coated steel, KV 255, Grant 120, or approved equal.

2.08 SITE FINISHING MATERIALS

- A. Stain and Finishing Materials: Comply with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.09 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.10 SHOP FINISHING

- A. Apply wood filler in exposed nail and screw indentations.

- B. On items to receive transparent finishes, use wood filler that matches the finish color, or accepts stain like the surrounding wood species, and is of type recommended for the applicable finish.
- C. Stain, seal, and finish surfaces exposed to view. Brush apply only.
- D. Seal internal surfaces and semi-concealed surfaces. Brush apply only.
- E. Prime paint surfaces in contact with cementitious materials.
- F. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- D. Install hardware in accordance with manufacturer's written instructions.
- E. Conform to requirements of WI "Manual of Millwork," latest edition, for joinery requirements.

3.03 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment in accordance with manufacturer's instructions.
- B. Brush apply one coat of preservative treatment on wood in contact with cementitious materials.
- C. Allow preservative to dry prior to installing.

3.04 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.05 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

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**SECTION 06 22 00
FLEXIBLE WOOD TAMBOUR PANELS**

PART 1 GENERAL

1.01 SUMMARY

- A. Provide flexible wood tambour panels of the following types:
 - 1. Solid wood tambours.
- B. Related Sections: Coordinate with the following as applicable:
 - 1. Section 06 20 00 - Finish Carpentry.
 - 2. Section 09 29 00 - Gypsum Board.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's literature including product characteristics and accessories.
- B. Shop Drawings: Submit diagram showing layout of pattern and configuration, including details of perimeter conditions and mounting.
- C. Verification Samples: Submit two 12 inch x 12 inch samples of materials selected for use to verify profile, color, and finish.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Minimum of 5 years experience manufacturing similar products.
- B. Installer: Minimum of 2 years experience installing similar products.
- C. Field Measurements: To the greatest extent practical, take field measurements prior to fabrication.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Basis-of-Design Manufacturer: Surfacing Solution, www.SurfacingSolution.com. or equal.

2.02 SOLID WOOD TAMBOUR PANELS

- A. Basis of Design: Solid Wood Tambour by Surfacing Solution.
 - 1. Species:
 - a. White oak.
 - 2. Sheet Lengths Available:
 - a. White Oak: 9 feet and 10 feet.
 - 3. Sheet Widths Available:
 - a. 12 inches.
 - b. 16 inches.
 - 4. Profile:
 - a. T493: Slat width of 1 inch and height of 1/2 inches.
 - 5. Field Finish: Stain and clear coat polyurethane, matte finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

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02/05/2026
FLEXIBLE WOOD TAMBOUR
PANELS
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- A. Tambour is intended for interior applications and is to be bonded to any clean, dry, structurally sound and rigid surface either horizontal, diagonal, or vertical.
 - 1. Each panel should be stretched by rolling the panel up with slats facing inward as well as bending concave carefully. This spreads each tambour slat out and spaces them evenly allowing for expansion and contraction.
 - 2. As soon as the panels arrive, they must be in a controlled environment (temperature and humidity) ranging from degrees (Fahrenheit) to 80 degrees (Fahrenheit). The humidity levels must not fall below 30% and not go above 50% for an extended period.
 - 3. If painting, staining, or coating, it is extremely important to stretch the material (as mentioned above) to allow for expansion with moisture prior to coating. The material must be acclimated for a minimum of 48 hours prior to finishing. Panels are then typically glued up with a standard paneling/construction adhesive (trowel or caulk style) onto a solid substrate. Thicker profiles should additionally either be held with finishing nails or braced in place until the glue cures.
 - 4. The thickness of the tambour varies in thickness depending on the profile (shape) chosen. It is recommended that both the solid wood and veneer finished with either a stain and a clear coat polyurethane finish, a clear coat, natural oil moisturizer, or painted to increase durability and life. Panels are nominal in size and are not finish cut to exact lengths, however we don't allow shorter than noted slat length.
 - 5. Each panel is hand assembled, sorting and matching color to the natural color variation of the wood chosen. The slats on a flexible backing with permanent pressure sensitive adhesive.
 - a. This is a natural wood product and will have color & grain variation. Hand assembled and color sorted slats within a reasonable color variation depending on the wood species.
 - 6. Install products in strict accordance with manufacturer's instructions, approved submittals and in proper relationship to adjacent construction.
 - 7. Clean substrate of dirt and bond breaking substances prior to beginning installation.
 - 8. Acclimatize panels at the installation site for a minimum of 48 hours prior to installation.
 - 9. Roll tambour panels in accordance with manufacturer's instructions to properly space slats.
 - 10. Follow manufacturer's recommendations for adhesives and mounting devices.
 - 11. Replace damaged or defaced products prior to Substantial Completion.

3.03 CLEANING

- A. Clean surfaces to remove soiling, stains, dust, and dirt using materials acceptable to manufacturer.
- B. Leave installation area clean and free of residue and debris resulting from work of this Section.

END OF SECTION

SECTION 06 41 13
WOOD-VENEER-FACED ARCHITECTURAL CABINETS: CUSTOM CABINET WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wood Veneer Casework

1.02 QUALITY ASSURANCE

- A. Comply with the "Manual of Millwork" of the Woodwork Institute (WI) for the grades specified.

1.03 SUBMITTALS

- A. Submit shop drawings showing each of the items to be provided under this section. Shop drawings shall be to scale and shall indicate the material grade and species, full size profiles of trim, thicknesses, size of parts, construction, fastening, blocking, clearances, assembly and installation details, applied finishes and surfacing, mill applied and/or built-in hardware, and necessary connections to work of other trades.
 - 1. Submit Product Data for all hardware items. Include list of all hardware. When requested, provide hardware samples.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity as recommended by WI Technical Bulletin 419-R - "Recommended Care and Storage of Architectural Millwork".

1.05 WARRANTY

- A. Provide manufacturer's warranty against defects in materials, fabrication and installation, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for replacement or repair of material and labor for a period of ten years, beginning at Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GRADES

- A. Provide wood casework in accordance with WI "Manual of Millwork," Section 14 Wood Casework, latest edition, for Custom grade. Each unit of casework shall bear the WI Certified Compliance Label.
 - 1. Construction Style: Style A, Frameless
 - 2. Construction Type: Type I Multiple self-supporting units rigidly joined together or Type II Single length sections to fit access openings.
 - 3. Materials:
 - a. Exposed Materials: White Birch for stain finish, rotary cut.
 - b. Semi-Exposed Materials: Match exposed materials.
 - c. Door and Drawer Front Style: As per the drawings. Personnel Locker doors shall be 1" minimum thickness.
 - d. Adjustable shelves shall be in accordance with WIC requirements, subject to a 40 pound per square foot spaced load, not to exceed 200 pounds total per shelf. Finish all edges of shelves.

2.02 ACCESSORIES

- A. Provide fasteners properly selected for the material to be fastened and the substrate to which the material will be fixed, designed to develop proper and adequate strength commensurate with the use.

2.03 HARDWARE

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WOOD-VENEER-FACED
ARCHITECTURAL CABINETS:
CUSTOM CABINET WORK
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- A. Provide all finish hardware for all casework included in work of this section:
1. Unless otherwise specified, all hardware shall be US32D, Satin Stainless Steel.
 2. Piano Hinges
 3. Magnetic Catches: National No. 61-570, or equal.
 4. Drawer and Door Pulls: Iron Munger 96mm (wire pulls), or equal.
 5. Drawer Guides: Full extension, 100 pound load capacity, KV8407 or equal, metal, epoxy coated with nylon rollers.
 6. File Drawer Guides: Heavy Duty, Full extension, 150 pound load capacity, KV8500 or equal, metal, epoxy coated with nylon rollers.
 7. File Drawer Rod: Removable rod with rollover.
 8. Adjustable Shelf Standards: Zinc coated steel, KV 255, Grant 120, or equal.
 9. Adjustable Shelf Clips: Zinc coated steel, KV 239, Grant 21, or equal 12.
 10. Plastic Grommets: Provide 2" plastic grommets, color as selected by Architect, one per desk area, or as indicated. Locate as directed by Architect.
 11. Personnel Locker:
 - a. Roller Catch: KV K901 Bullet Catch, or equal, satin stainless steel finish.
 - b. Clothes Hanger Rod: Bobrick B207, cut to fit.
 - c. Towel Bar: Bobrick B6747, 18 inches, or equal.
 - d. Mirror: Provide mirrored glass with beveled edge, size as indicated.
 - e. Padlock Cam Hasp: 5902CHR. Padlock by Owner
 12. Door Locks: National No. C8704, or equal. All locks keyed differently. Provide 6 keys for each lock. Provide locks for each door as indicated.
 13. Drawer Locks: National No. C8703, or equal. All locks keyed differently. Provide 6 keys for each lock. Drawers to receive locks will be as directed. For bidding purposes assume 6 drawers total to receive locks

2.04 MISCELLANEOUS MATERIAL

- A. Wood trim: Trim shall be birch, solid stock, rip cut, sized as indicated and required.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate installation of bucks, anchors, blocking, electrical, plumbing and mechanical work which is to be placed in or behind casework.
1. Contractor shall be responsible for inspection and acceptance of the wall and ceiling framing. Contractor shall verify that all framing is straight, plumb, and level, and ready for installation of casework. Commencement of casework installation indicates acceptance of existing conditions.

3.02 CONSTRUCTION

- A. Conform to requirements of WI "Manual of Millwork," latest edition, for joinery requirements.
- B. Fabricate casework to be square, consistent with the drawings and capable of self-supporting.

3.03 INSTALLATION

- A. Install work in this section as specified in WI "Manual of Millwork."
- B. Install all components plumb and level, in accordance with approved Shop Drawings and manufacturer's product installation guidelines.

3.04 FINISHING

- A. Finish all casework and related trim as specified in WI "Manual of Millwork," Section 5 for shop finishing, Custom Grade. Field finishing of casework will not be permitted.

3.05 ADJUSTMENT, CLEANING FINISHING AND PROTECTION

- A. Repair damaged and defective casework wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace casework. Adjust joinery for uniform appearance.
- B. Clean casework on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

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SECTION 06 41 16
PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- C. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).
- D. BHMA A156.9 - Cabinet Hardware; 2020.
- E. BHMA A156.11 - American National Standard for Cabinet Locks; 2024.
- F. BHMA A156.16 - Standard for Auxiliary Hardware; 2023.
- G. BHMA A156.18 - Standard for Materials and Finishes; 2020.
- H. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.
- I. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- J. PS 1 - Structural Plywood; 2023.

1.02 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-faced architectural cabinets.

1.03 SUBMITTALS

- A. Product Data: For each type of product, including panel products high-pressure decorative laminate adhesive for bonding plastic laminate and cabinet hardware and accessories.
- B. Sustainable Design Submittals:
 - 1. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- D. Samples:
 - 1. Plastic laminates, for each color, pattern, and surface finish.
 - 2. Exposed cabinet hardware and accessories, one unit for each type and finish.
- E. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Licensee of WI's Certified Compliance Program.

1.05 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.01 PLASTIC LAMINATE FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
- B. Grade: Custom Grade for plastic laminate faced cabinets unless noted otherwise.
 1. Type of Construction: Frameless.
- C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart High Pressure Laminate. or a comparable product by one of the following:
 - a. Formica Corporation.
 - b. Equal approved by the Architect.
 - 1) Laminate Cladding for Exposed Surfaces:
 - 2) Horizontal Surfaces: Grade HGS.
 2. Post-formed Surfaces: Grade HGP.
 3. Vertical Surfaces: Grade VGS.
 4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
 5. Materials for Semi-exposed Surfaces:
 6. Surfaces Other Than Drawer Bodies normally exposed to view: High-pressure decorative laminate, NEMA LD 3, Grade CLS.
 7. Surfaces Other Than Drawer Bodies normally not exposed to view: High-pressure decorative laminate, NEMA LD 3, Grade CLS.
 8. Drawer Sides and Backs: No-void hardwood plywood.
 9. Drawer Bottoms: Hardwood plywood.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
 - b. Solid colors with core same color as surface, matte finish.
 - c. Wood grains, matte finish.
 - d. Patterns, matte finish.
 - e. Basis-of-design finish: Wilsonart Linearity Finish with AEON, (7998K-18) Low Line.

2.02 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
 2. Particleboard: ANSI A208.1, Grade M-2, Grade M-2-Exterior Glue.
 3. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 4.
 5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 6. File Drawers: Inside height of all file drawers shall be 12 inches clear, width as required for "legal" files.
 7. Upper Cabinets: Where noted, provide a 2 inch lip on upper cabinets with under cabinet light fixtures.

8. Provide rubber bumpers on inside corners of all doors and drawers to prevent laminate to laminate contact.
9. Adjustable shelves shall be in accordance with WI requirements, subject to a 40 pound per square foot spaced load, not to exceed 200 pounds total per shelf. Finish all edges of shelves. Finish as indicated for semi-exposed surfaces.
10. All cabinet doors and drawer fronts to be WIC Type V, solid banding, with radiused edges.
11. Toe Kicks: High Pressure Laminate .048" minimum thickness, NEMA LD 3. Provide with scratch resistant, Armored Protection Surface, by Formica, Wilsonart or approved equal. Color and pattern as indicated on drawings.

2.03 CABINET HARDWARE AND ACCESSORIES

- A. Cabinet Hinges:
 1. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, [100][135] 170 degrees of opening. All metal concealed self-closing (soft close) hinges having passed a 100,000 cycle test, Blum-motion or equal. Hinges shall have a lifetime warranty as offered by the manufacturer. Provide two hinges per door under 36 inches high, three hinges per door over 36 inches.
 2. Piano Hinges at Bunk Room Lockers.
- B. Back-Mounted Pulls: BHMA A156.9, B02011.
 1. C Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- C. Catches: Magnetic catches, BHMA A156.9, B03141 where applies. Doors and drawers are generally soft-close type.
- D. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf lateral retention pin.
- E. Drawer Slides: BHMA A156.9. Soft-close type unless noted otherwise.
 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel or epoxy-coated steel with polymer rollers.
 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
 5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
- F. Door Locks: BHMA A156.11, E07121. National No. C8704, or equal. All locks keyed differently. Provide 6 keys for each lock. Provide locks for each door as indicated.
- G. Drawer Locks: BHMA A156.11, E07041. National No. C8703, or equal. All locks keyed differently. Provide 6 keys for each lock. Drawers to receive locks will be as directed. For bidding purposes, assume 8 drawers total to receive locks.
- H. Door and Drawer Silencers: BHMA A156.16, L03011.
- I. Personnel Locker Hardware:
 1. Roller Catch: KV K901 Bullet Catch, or equal, stainless steel finish.
 2. Clothes Hanger Rod: Bobrick B207, cut to fit.
 3. Towel Bar: Bobrick B6747, 18 inches, or equal.
 4. Mirror: Provide mirrored glass with beveled edge, size as indicated.
 5. Padlock Cam Hasp: 5902CHR. Padlock by Owner.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 2. Satin Stainless Steel: BHMA 630.

2.04 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.05 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burs.

2.06 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
 - 1. Back-priming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: System - 11, catalyzed polyurethane.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before finishing.
 - 4. Staining: None required.
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.02 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- C. C Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners. Use fine finishing nails or finishing screws for exposed trim fastening, countersunk and filled flush with woodwork.

- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets in accordance with WI seismic installation guidelines. Install with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 8 inches o.c. with No. 14 wafer-head sheet metal screws through 16 gauge metal backing or metal framing behind wall finish. For wood framing, use No. 14 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips
- F. G Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

END OF SECTION

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SECTION 06 61 13
ARCHITECTURAL FIBERGLASS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Fabrication of fiberglass-reinforced polyester (FRP) cornice profiles.
- B. Related Documents and Sections:
 - 1. General Conditions, Supplementary Conditions and Division 1 General Requirements apply to the work of this section.
 - 2. Section 061000, "Rough Carpentry", for blocking.
 - 3. Section 079200, "Joint Sealants".

1.02 QUALITY ASSURANCE

- A. The fiberglass manufacturer shall be one who is currently in the business of manufacturing and supplying architectural fiberglass components for the building construction industry and who can demonstrate the capability.
- B. The fiberglass manufacturer shall have been engaged in the fiberglass industry for at least 10 years doing work with projects comparable in size, scope, detail, and complexity to that shown and specified.
- C. Single Source Responsibility for Architectural Fiberglass: Obtain architectural fiberglass from a single source with resources to provide products complying with requirements indicated without delaying the work.
- D. Fire Test Response Characteristics: Provide architectural fiberglass and related materials with fire test response characteristics as specified elsewhere in this section as determined by testing identical products per test method ASTM E-84 or other testing and inspecting agency acceptable to authorities having jurisdiction. Provide written certification that supplied architectural fiberglass panels meets or exceeds the criteria.

1.03 SUBMITTALS

- A. Qualification Data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.
 - 1. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Product Data:
 - 1. For products of standard manufacture, not custom fabricated for this work, submit manufacturer's catalog illustrations, specifications, anchor details and installation instructions.
- C. Color Selection:

1. Architectural Mall FRP is manufactured in standard white, however Architects can submit custom color sample selection chips of actual material showing color, texture and sheen available for initial review.
 - a. FRP Finish to be White unless (see B)
 - b. Architect will supply custom paint color sample for matching.

D. Shop Drawings:

1. Submit shop drawings for fabrication and erection. Include plans, elevations, sections, profiles, and details of cornice panels. Indicate dimensions of each profile and component. Include for comparison a dimensioned drawing showing plan elevation section and details of existing cornice section used for model purposes if applicable. Indicate those features, which differ from fiberglass replication. Include details for panel connections, anchorage to substructure and all miscellaneous accessories. Show all special corner pieces, splices for panels and inside corner transitions and terminations for panels. Provide layout drawings including seam locations for each elevation.

E. Samples:

1. For each cornice type submit sample cornice panel section, large enough to include all panel features including joints. Construct sample panel to show all connection points, embedded connection and reinforcing clips, include typical fasteners to complete the submission.

F. Submit detailed maintenance instructions for inclusion in final operation and maintenance manuals.

G. Submit warranty on completed fiberglass components in writing against defects of materials and workmanship and to meet the specified requirements of this Section for a period of one (1) year from delivery to site.

1.04 HANDLING AND SHIPMENT

- A. Provide shipping crates of sufficient size and strength to protect components during shipping or ship fiberglass components in padded dedicated moving van.
 1. Provide additional protection as may be necessary to prevent soiling of surfaces and marring of finish.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURES

- A. Subject to compliance with requirements, fiberglass manufacturer offering products that may be incorporated in work include:

1. Architectural Mall, Inc 323 St Paul Blvd., Carol Stream, IL
60188, T. 877-279-9993, F. 844-817-0480
www.columnsandbalustrades.com sales@architecturalmall.com

2.02 MATERIALS

- A. General: The fiberglass reinforced polyester plastic components shall be designed, fabricated and erected to conform to the state of Building Code, Local Codes and to the Architect's design criteria.
- B. Glass cloth, matt and "Chop" shall be equal to the products of PPG-Owens Corning. Type "E" random chopper fibers.
- C. Polyester resins when requested shall be equal to Class A, AMI Spec 67. The resin shall be flame retardant, promoted thixotropic polyester resin designed for use in hand laid up and spraying processes. The resin shall be specifically formulated for use in applications that require an ASTM E 84, Class I flame spread rating, without the use of fillers or antimony trioxide, with an ASTM E 84 flame spread rating of 25 unfilled smoke density of 380 or under.
- D. Gel Coat: The gel coat shall be a high-performance product with ultraviolet inhibitors as recommended by the gel coat and fiberglass panel manufacturer.
- E. Fiberglass-reinforced polyester components shall be manufactured using the specified resins, reinforced with chopped glass fibers. All exposed surfaces shall be finished with custom colored gel-coat.
- F. Internal metal reinforcement, anchorage clips, brackets and all other "built-in" accessories shall be captured and additionally reinforced with additional glass fiber and matt of sufficient thickness as required by the panel manufacturers design.
- G. All metal hardware, both loose and embedded, shall be stainless steel.
- H. Gel coat thickness shall be 0.015" minimum to 0.025" maximum.
- I. Panel thickness shall be 3/16" minimum.
- J. FRP Properties, Min. Values:
 1. Gel Coat Thickness: 22 mils. Wet
 2. Bearing Strength: 9,000 psi per ASTM D638
 3. Shear Strength: 7,500 psi
 4. Flexural Strength: 20,000 psi per ASTM D790
 5. Flexural Modulus: 0.9×10^6 psi per ASTM D790
 6. Tensile Strength: 12,000 psi per ASTM D638
 7. Compressive Strength: 17,000 psi per ASTM D695
 8. Relative Density (Specific Gravity): 1.5

2.03 PANEL FABRICATION

- A. Prior to commencement of work review the job site before selective

demolition begins to determine the layout, spacing and termination of the existing cornice. Duplicate these layouts intersections and relationships in so far as practical. Identify and resolve panel detail conflicts in advance and identify such condition and resolutions on the shop drawings.

- B. Carefully measure each existing cornice assembly component and replicate size, profile, position, and detail in the finished panel so far as practical. Indicate on shop drawings those indentations and/or detail which cannot be duplicated in the replication due to physical limitations of the manufacturing process.
- C. Full-size models and mock-ups shall be hand carved and machined as required to produce the replication patterns.
- D. Production molds shall be constructed from successive layers of glass fiber with tooling gel coat or alternately from rubber molds. Molds shall be constructed with sufficient thickness and rigidity to prevent deflection, warp age and defects during panel production.
- E. Form panel ends with sealable lap joints. Use lap joints with sufficient depth to accommodate mating and alignment of panel surfaces and panel-to-panel sealant components.
- F. Provide all special transition, corner pieces (inside and outside) and special closures necessary for a complete, visually continuous, weather tight installation.
 - 1. All inside and outside corners shall be shop fabricated. Fabrication of corners in field will not be permitted.
- G. Coordinate cutouts required for drain inlets, rainwater conductors and other penetrations. Reinforce panel as required and provide special formed closures to make joints and intersection weather tight.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Coordinate required blocking for attachment of cornice panels to substructure. Provide additional, wood preservative treated or metal stud framing as may be required to attached and reinforce cornice panels for a solid installation.
 - 1. Coordinate installation with any metal gutter lining work or flashing above and wood/metal substrates.
- B. Erect cornice panels plumb, square and true to line and level. Follow fiberglass panel manufacturer's recommendations with regard to installation clearances, notches, and formation of panel- to-panel joints.
- C. Install sealant and accessories as work progresses, so as to make the work weather tight.

- D. Provide each panel with joints such that adjacent panels mate to produce flush joints. Recess blocking or notch continuously behind each panel joint. Set panels to ensure a maximum joint thickness of 3/8".
- E. Prepare each cornice panel section for installation by carefully sanding joints and shrinkages where blocking occurs to assure a tight flush fit.
- F. Fill joints with a continuous bead of sealant. Tooling finished joints to a slightly concave profile ensuring complete filling and flush installation.
- G. Carefully monitor ambient temperatures at time of panel installation and observe all panels to panel clearances recommended by the fiberglass manufacturer.
- H. Do not cut or abrade finishes, which cannot be completely restored in the field. Installer to make small inconspicuous finish repairs using manufacturer's color matching gel fill finish. If too large of a repair is needed return to fiberglass manufacturer for alterations or new units.
- I. Use only stainless steel connectors approved by the panel manufacturer and which will develop the strength required by fiberglass panel manufacturer's calculations. The installer shall supply these connectors.
- J. Countersink all exposed fasteners. Patch all attachment holes with gel fill finish supplied by the fiberglass panel manufacturer for field application. Finish attachment points so that there is no detectable difference in the completed panel surface.
- K. Clean installed panel to remove all dirt, smudges, and construction dirt. Use only those cleaning products and procedures recommended by the fiberglass manufacturer.

END OF SECTION

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SECTION 06 61 19
SOLID SURFACING FABRICATIONS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Solid Surface Countertops and Wall Panels
- B. Stainless Steel Countertops and Shelves
- C. Support Systems

1.02 QUALITY ASSURANCE

- A. Manufacturer with 10 years experience.
- B. Installer with minimum 5 years experience.
 - 1. Provide certification from the Manufacturer or General Contractor that Installer is certified to install the product.

1.03 SUBMITTALS

- A. Submit shop drawings showing each of the items to be provided under this section. Shop drawings shall be to scale and shall indicate the material grade and species, full size profiles of moldings, thicknesses, size of parts, construction, fastening, blocking, clearances, assembly and erection details, applied finishes and surfacing, mill applied and/or built-in hardware, and necessary connections to work of other trades.
 - 1. Submit Product Data for all hardware items. Include list of all hardware.
- B. Submit samples of all colors in Manufacturer's standard selection for Architect's approval.
 - 1. Submit samples of radius edge details for approval.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

1.05 WARRANTY

- A. Provide manufacturer's warranty against defects in materials, fabrication and installation, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for replacement or repair of material and labor for a period of ten years, beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GRADES

- A. Solid Surface / Quartz Countertops: Countertops shall be homogeneous filled polymer material as indicated. Thickness shall be 1/2 inch minimum. Furnish and install complete with apron, back
 - 1. and end splashes and cutouts for all plumbing fixtures. Edges shall be 1/4" radius, double thickness at edges with color lamination core to match colors as selected.
 - 2. Material: Cast, filled, acrylic; not coated, laminated or of composite construction, meeting ANSI Z124, Type Six, and FS WW-P-541 E/GEN.
 - a. Superficial damage to a depth of 1/32 inch shall be repairable by sanding or polishing.
 - 3. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints by chemical bond. Joints shall be inconspicuous in appearance and without voids. Reinforce joints with strip of solid polymer material, 2" wide.
 - a. Where joints are required verify joint location with Architect prior to fabrication.
 - 4. Cove Backsplash: Fabricate backsplashes using 1/2 inch solid material. Create 1/2 inch radius cove at intersection of counters and backsplashes.
 - 5. Front Edge: At lavatories and other counters provide a waterfall front edge.

6. Sealant: Manufacturer's standard mildew-resistant, FDA, UL listed silicone sealant in colors matching components.
7. Fabrication: Factory fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed Instructions and technical bulletins.
 - a. Provide factory cutouts for plumbing or other fittings and accessories as indicated on the Drawings.
 - b. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Architect shall reject defective and inaccurate work.
 - c. Finish: Provide surfaces with a uniform matte finish (Gloss range of 5-20).
8. Sub-tops: Provide solid plywood sub-tops beneath solid surface tops.
- B. Solid Surface Wall Panels: Wall Panels shall be homogeneous filled polymer material as indicated. Thickness shall be 1/4 inch minimum.
 1. Material: Cast, filled, acrylic; not coated, laminated or of composite construction, meeting ANSI Z124, Type Six, and FS WW-P-541 E/GEN.
 - a. Superficial damage to a depth of 1/32 inch shall be repairable by sanding or polishing.
 2. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints by chemical bond. Joints shall be inconspicuous in appearance and without voids.
 - a. Where joints are required verify joint location with Architect prior to fabrication.
 3. Sealant: Manufacturer's standard mildew-resistant, FDA, UL listed silicone sealant in colors matching components.
 4. Fabrication: Factory fabricate components to greatest extent practical to sizes and shapes
 - a. indicated, in accordance with approved shop drawings and manufacturer's printed Instructions and technical bulletins.
- C. Stainless Steel Countertops and Shelves: Type 316, 14 gauge stainless steel countertop with integral backsplash as indicated. Fabricate in shop to greatest extent possible to sizes and shapes indicated.
 1. Where joints are required verify joint location with Architect prior to fabrication (must show in shop drawings).
 2. Splash shall be coved, as indicated on drawings. Provide end splashes with square butt joints.
 - a. Edge shall extend beyond face of doors/drawers in the closed position and return back
 - 1) to sub-top.
 3. Sub-tops: Provide solid plywood sub-tops beneath sheet metal countertops.
 4. Finish: Provide surfaces with a brushed finish

2.02 HARDWARE

- A. Provide required hardware for all solid surface material included in this section:
 1. Unless otherwise specified, all fasteners and hardware shall be US32D, Satin Stainless Steel.
 2. Countertop and Shelf Support Brackets: Fixed, L-shaped, corner reinforced, face-of-stud mounting.
 - a. Material: Steel.
 - b. Finish: Manufacturer's standard, factory-applied, textured powder coat.
 - c. Height and Support Length: Per the drawings.
 3. Plastic Grommets: Provide 2" plastic grommets, color as selected by Architect, one per desk area, or as indicated. Locate as directed by Architect.

4. Provide fasteners designed to develop proper and adequate strength commensurate with the use, and to the materials and substrate to which the material will be fixed.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate installation of anchors, blocking, electrical, plumbing and mechanical work which is to be placed in or behind countertops or wall surfacing.
 1. Contractor shall be responsible for inspection and acceptance of the wall and ceiling framing.
 2. Contractor shall verify that all framing is straight, plumb, and level, and ready for installation of the work. Commencement of installation indicates acceptance of existing conditions.

3.02 FABRICATION

- A. Solid Surface Countertops: Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Reinforce joints as required.
 1. Adhere sinks and lavatory bowls to tops using manufacturer's recommended sealant, adhesive and mounting hardware.
 2. Provide backsplashes and sidesplashes as indicated on the Drawings. Adhere to tops using manufacturer's standard color matched silicone sealant.
 3. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace all stained and damaged components.
- B. Stainless Steel and Sheet Metal Countertops: Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data. Weld all joints and grind smooth, with joints inconspicuous in finished work. Reinforce joints as required.
 1. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained and damaged components.

3.03 INSTALLATION

- A. Make plumbing connections to sinks in accordance with Division 23, Mechanical.
- B. Make electrical connections to outlets and switches in accordance with Division 26, Electrical.

3.04 ADJUSTMENT, CLEANING FINISHING AND PROTECTION

- A. Repair damaged and defective work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace the work. Adjust joints for uniform appearance.
- B. Clean the material on exposed and semi-exposed surfaces. Replace or restore damaged or soiled areas.

END OF SECTION

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SECTION 06 83 16
FIBERGLASS REINFORCED PANELING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass reinforced plastic wall panels.
- B. Trim.

1.02 RELATED DOCUMENTS

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

1.03 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.
- B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2022.
- F. ISO 846 - Plastics - Evaluation of the Action of Microorganisms; 2019.
- G. ISO 2812-1 - Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water; 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00-Administrative Requirements.
- B. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods.
- C. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- D. Selection Samples: Submit 4" x 4" manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

1.05 QUALITY ASSURANCE

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for and reasonably incidental to the completion of all work of this section, as indicated on drawings and specified herein. Work, materials and equipment not indicated or specified which is necessary for a complete and proper operation of the work of this Section in accordance with the true intent and meaning of the Contract Documents shall be provided and incorporated at no additional cost to the Owner.

1.06 WARRANTY

- A. Furnish one-year guarantee against defects in material and workmanship.

1.07 DELIVERY AND STORAGE

- A. Comply with instructions and recommendations of manufacturer and as herein specified.

- B. Deliver materials to project site in original packages or containers clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classification.
- C. Store materials in original undamaged packages or containers. Do not store rolled goods in upright position. Maintain temperature in storage area above 40 degrees Fahrenheit.

PART 2 – PRODUCTS

2.01 FIBERGLASS REINFORCED WALL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide standard fiberglass reinforced wall panels by Crane Composites, or equal.
- B. Wall Panels: Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D5319.
 - 1. Width: 4-feet nominal.
 - 2. Thickness: 0.090-inches nominal.
 - 3. Finish and Color: As indicated on drawings.
- C. Moldings and Trim: Trim pieces for a complete installation with standard selection from the manufacturer.
- D. Attachment:
 - 1. Mechanical Fasteners: Per manufacturer's recommendations.
 - 2. Adhesive: As recommended by the manufacturer
 - 3. Sealant: As recommended by the manufacturer

PART 3 – EXECUTION

3.01 INSTALLATION OF FIBERGLASS REINFORCED WALL PANELS

- A. Install in accordance with manufacturer's instructions.
 - 1. Install panels vertically.
 - a. Apply adhesive to back of panels.
 - b. Leave 1/8-inch space between panel edge joints and fill with sealant.
 - c. Mechanically attach panel edges. No exposed fasteners. Cover with sealant and trim, no 'buttons' allowed.
 - 2. Wall Trim: All edges, joints and inside and outside corners are to be finished with trim pieces appropriate to that purpose. Trim shall be installed in accordance with manufacturer's instructions.

3.02 ADJUST AND CLEAN

- A. Replace removed plates and fixtures; verify cut edges of wall coverings are completely concealed.
- B. Remove surplus materials, rubbish, and debris resulting from wall covering installation upon completion of work, and leave areas of installation in neat, clean condition.

END OF SECTION

**SECTION 07 13 00
UNDER SLAB VAPOR BARRIER**

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes single ply, under-slab vapor barrier over sand or gravel bed.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 03 30 00 - Cast-In-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.
- B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.04 SUBMITTALS

- A. Product Data: Include manufacturer's written instruction for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of vapor barrier.
- B. Shop Drawings: Include details for penetrations, inside and outside corners, tie-ins with adjoining construction, and other termination conditions.
- C. Product Test reports.

1.05 PERFORMANCE REQUIREMENTS:

- A. Vapor Barrier membrane shall have the following properties:
 - 1. Permeance, as tested after conditioning, shall be less than 0.01 perms (gr/ft sq/hr/in-Hg, in accordance with ASTM E1745, paragraph 7.1.2 through 7.1.5)
 - 2. Strength: Class A (((ASTM E1745)))
 - 3. Minimum Thickness of plastic retarder materials: 15 mils.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: A qualified firm that is approved, by the manufacturer to install manufacturer's products.
- B. Preinstallation Conference: Conduct at Project Site.
 - 1. Review vapor barrier installation requirements including surface preparation, substrate conditions and preparation, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repair.

1.07 WARRANTY

- A. Provide Manufacturer's Warranty for Life of the Building.
- B. Provide Installation Warranty for minimum two (2) years.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in their original undamaged containers in a clean, dry, protection location and within the temperature range required by vapor barrier manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Store rolls according to manufacturer's written instructions.
- D. Protect stored materials from direct sunlight.

1.09 PROJECT CONDITIONS

Issued for Construction

Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026

UNDER SLAB VAPOR BARRIER

07 13 00 -1

- A. Environmental conditions: Apply vapor barrier within the range of ambient and substrate temperatures recommended by vapor barrier manufacturer. Do not apply vapor barrier over frozen substrate or when temperature is below 32 degrees Fahrenheit.

PART 2 - PRODUCTS

2.01 UNDER—SLAB VAPOR BARRIER

- A. Vapor Barrier Sheet: 15-mil-thick.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - a. Stego Wrap Vapor Barrier; Stego Industries, LLC.
 - b. VaporGuard; Reef Industries, Inc.
 - c. Permoulded Membrane Vapor Seal; WR Meadows.
 - d. VB-350, Barrier-Bac; Inteplast Group.

2.02 AUXILIARY MATERIALS:

- A. Seam Tape: High Density Polyethylene Tape with pressure sensitive adhesive, minimum 4 inches wide, as recommended by the manufacturer.
- B. Pipe Boots, Construct pipe boots from vapor barrier material and pressure sensitive tape in accordance with manufacturers printed instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, area, and conditions, with installer present, for compliance with requirements and other conditions affecting performance of Work.
 - 1. That compacted subgrade is dry, smooth, and sound; and ready to receive vapor barrier.

3.02 PREPARATION

- A. Prepare substrate according to manufacturer's written instructions. Provide clean, debris-free, and visibly dry substrate for vapor barrier installation.

3.03 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's written instructions and recommendations in ASTM E1643.
- B. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.
- C. Lap vapor barrier over footings and seal to foundation wall.
- D. Overlap joints 6 inches and seal with manufacturers tape.
- E. Seal penetrations (including pipes and conduits) with pipe boot and tape.
- F. Repair damaged areas by cutting patches of vapor barrier, overlapping damage area by at least 6 inches and taping all four sides with tape provided by the same manufacturer.

END OF SECTION

**SECTION 07 18 13
ROOF DECK SURFACING**

PART 1 – GENERAL

1.01 WORK INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete a waterproof neoprene composition traffic bearing roof deck surfacing as scheduled on the drawings and/or specified herein.

1.02 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.03 REFERENCE STANDARDS

- A. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer or applicator who is certified as factory trained, and is a SSPC member with a minimum current CCB training documentation. Contractor must demonstrate they are qualified, specialized in the installation of waterproof deck covering system types similar to that specified for this Project to the satisfaction of the Owner and Architect.
- B. Single-Source Responsibility: Obtain roof deck surfacing materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.
- C. Pre-Qualified Materials: Submit any request for alternative products for review two weeks prior to bid date under the provisions of Section 01 25 00 – Substitution Procedures. Any request for alternate products received after this date will not be considered.

1.05 WARRANTY

- A. Provide 5 year Manufacturer's warranty, including installation warranty by factory authorized installer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components. Provide documentation that the correct materials and quantity have been received. Also document material temperature and the general condition of material being received.
- B. Comply with manufacturer's directions for materials storage to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. At a minimum take ambient temperature, humidity, and dew point, surface temperature and materials temperature at the start of work, mid-day and at the completion of work each work is performed on the project.

1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with roof deck surfacing manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation and other conditions required to execute and protect work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Basis of Design: Dex-O-Tex Weatherwear as manufactured by Crossfield Products Corp., or equal.

- B. The trowel applied waterproof neoprene composition traffic bearing roof deck surfacing system shall be composed of a slip-sheet, waterproof membrane, traffic surfacing and finish coats, and shall conform to the following standards:
 - 1. Traffic deck binder and all rubber emulsions shall be compounded with neoprene liquid and shall have a minimum neoprene solids content of 35% when tested by the dry cup method.
 - 2. Aggregate for traffic surface coating shall be suitably graded, fine trap-rock passing a #20 mesh sieve and retained on a #40 mesh sieve.
 - 3. Slip-Sheet shall consist of an asphalt-saturated glass fiber matting weighing not less than 20 lbs. per 100 sq feet and no more than 30 lbs. per 100 square feet and contain no rag or organic fibers.
 - 4. Fabric used as reinforcement for waterproof flashing shall be 7-1/2 oz. woven polypropylene fabric.
 - 5. Fabric used as reinforcement for waterproof membrane on horizontal surfaces shall be a minimum 1 oz. per square foot non-directional glass fiber matting.
- C. Final Finish dressing shall be a single component, water-phase acrylic latex emulsion material, pigmented and of a consistency suitable for roller application.

2.02 PROPERTIES

- A. Colors: As selected by Architect from manufacturer's standard colors, or as indicated in the drawings.
- B. Physical Properties:
 - 1. Provide a waterproof deck covering system that meets or exceeds the listed minimum physical property requirements of the Basis of Design product:
 - a. Weight.....2.5 lbs. per Sq.Ft.
 - b. Accelerated Aging (ASTM D756).....No cracking, blistering, delamination, chalking, crazing or color change
 - c. Abrasion (ASTM D1242).....4.3% Thickness Reduction (1,000 revolutions, 1,000 gr. No. 80 TP load aluminum oxide grit)
 - d. Percolation (ICC standard).....Complies to ICC Test Method for this Standard
 - e. Water Absorption (ASTM D570).....<6.09% No warping or cracking
 - f. Wind Uplift (ICC Factory Mutual 1-52).....Qualifying Wind Velocity with Safety Factor of 3 Wind Velocity 131 MPH
 - 2. Flammability (ASTM E108), UL 790, NFPA 256)
 - a. Intermittent Flame Exposure.....Class A
 - b. Spread of Flame.....Class A
 - c. Burning Brand.....Class A
 - 3. Chemical Resistance (ASTM D2299)
 - a. Industrial Detergent.....No change in texture or color
 - b. Salt (20%).....No change in texture or color
 - c. Ammonia Solution (5%).....No change in texture or color
 - d. Muriatic Acid (10%).....No change in texture or color
 - e. Chlorine (10%).....No change in texture or color
 - f. Kerosene.....No change in texture or color
 - g. Turpentine.....Slight temporary softening of surface
 - 4. Paint thinner.....Slight temporary softening of surface

2.03 SUPPLEMENTAL MATERIALS

- A. Optional Decorative Finishes: Type recommended or produced by manufacturer of waterproof neoprene composition traffic bearing roof deck surfacing system to achieve desired color, texture, pattern and finish as selected by the Architect.

- B. Optional Top Coat: Type recommended or produced by manufacturer of waterproof neoprene composition traffic bearing roof deck system for any specific chemical resistance, skid resistance or profile of desired final finish.

PART 3 – EXECUTION

3.01 CONTRACTOR QUALIFICATIONS

- A. Traffic-bearing roof deck covering shall be installed in strict accordance with the manufacturer's recommendations by a contractor trained and approved by the manufacturer and have a minimum of five years' experience in the application of the materials.

3.02 INSPECTION

- A. Examine the areas and conditions where the waterproof neoprene composition traffic bearing roof deck surfacing is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.
- B. Evaluate level of moisture in the substrate to determine that moisture levels are acceptable for application of specified waterproof deck covering system.

3.03 PREPARATION

- A. Substrate: Perform preparation and cleaning procedures according to waterproof deck covering manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry and neutral substrate for application of waterproof deck covering.
- B. Materials: Mix aqueous emulsions and aggregate when required as per manufacturer's instructions.

3.04 FIELD CONDITIONS

- A. Traffic-bearing roof deck covering shall not be applied during either freezing or inclement weather, or when such weather can logically be expected.

3.05 APPLICATION

- A. Deck surface must be flat and sloped to drain to not allow ponding. Slope ¼ inch per foot if the tolerances permit with underlayment.
- B. Apply each component of roof deck surfacing system according to manufacturer's directions to produce a uniform monolithic surface of thickness indicated.

3.06 CURING, PROTECTION AND CLEANING

- A. Cure waterproof neoprene composition traffic bearing roof deck surfacing materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

END OF SECTION

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**SECTION 07 25 00
WEATHER BARRIERS**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes: Weather-resistive barriers (building paper) including sealing joints and protrusions through membranes, with accessories as required for complete installation.

1.03 RELATED SECTIONS

- A. Section 06 10 00 – Rough Carpentry
- B. Section 07 62 00 - Sheet Metal Flashing and Trim
- C. Section 07 65 26 - Self Adhering Flashing Tape
- D. Section 09 24 00 - Cement Plastering

1.04 REFERENCES

- A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- B. ASTM D779 - Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method; 2016.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- F. ICC-ES AC308 - Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).
- G. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).
- H. ICC Evaluation Service Report 1027.
- I. AAMA 711 - Voluntary specification for self-adhering flashing

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer current technical literature for each type of membrane and component.
- B. Quality Assurance Submittals
 - 1. Manufacturer Instructions: Provide manufacturer's written installation instructions.
- C. Warranty: Provide manufacturer's standard warranty.
 - 1. Products shall be free from defects in materials and workmanship for a period of two years from the date of purchase. This warranty does not apply to loss due to abuse. Material found to be defective will be replaced at no charge by the manufacturer, but in no event shall the manufacturer be liable for any other costs or damages, including any labor costs.

1.06 QUALITY ASSURANCE

- A. Qualifications
 - 1. Installer shall have two years of experience with installation of similar weather barrier assemblies under similar conditions.

2. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store weather barrier materials as recommended by system manufacturer.

1.08 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

PART 2 – PRODUCTS

2.01 VAPOR PERMEABLE WEATHER-RESISTIVE BARRIER

- A. Two-ply polymeric housewrap, WeatherSmart by Henry Company, or equal.
 1. Pressure sensitive sheathing tape by Henry Company, or equal.
 2. Adhesive Type: Acrylic.
- B. Asphalt saturated kraft Grade D breathable type building paper, HydroTex by Henry Company, or equal.

2.02 SEALANT

- A. One component, moisture curing, non-sag, gun-grade elastomeric polymer for use as a sealant or liquid applied flashing, Moistop Sealant by Henry Company, or equal.
- B. Reference Standards: AAMA 808.3 and ASTM C920.
- C. Movement Capability: +/- 25 percent in accordance with ASTM C719.
- D. Max VOC: 9 g/L in accordance with ASTM D3960.
- E. Compatibility: Tested for compatibility with flexible flashing; AAMA 713.

2.03 FLEXIBLE FLASHING

- A. Flexible Flashing: Self-adhesive, SBS modified asphalt waterproof membrane laminated to high density engineered film membrane, FortiFlash Waterproof Flashing by Henry Company, or equal.
 1. Reference Standards: AAMA 711.
 2. Water Vapor Permeance: <.08 perms 25-Mil, <.05 perms 40-Mil (waterproof); ASTM F1249, E96 (A).
 3. Water Resistance: 200 hours minimum (waterproof); ASTM D779.
- B. Primer: Polymer emulsion based primer for self-adhesive membranes as needed, Aquatac Primer by Henry Company, or equal.
 1. Composition: Water based, VOC< 50 g/L.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.
- B. Ensure items which pass through membrane are properly and rigidly installed, substrate is free of projections and irregularities which may be detrimental to proper installation of membrane.
- C. Surfaces should be dry and cleaned free of any dirt or other substances that may interfere with adhesion, as well as any sharp protrusions. Surfaces shall have no voids, damaged, or unsupported areas. Repair surfaces before installing membrane.

3.02 INSTALLATION

- A. Apply membrane in accordance with manufacturer's recommendations, laid smooth without folds or bunches of material.
 - 1. Seam Overlap: As recommended by building paper manufacturer for specific building paper material and application indicated.
 - 2. Sealing: Seal items projecting through building paper.
- B. Inspect and repair building paper prior to application of finish material over building paper; tape tears, perforations and similar damage.
- C. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- D. Start weather barrier installation at a building corner, leaving 6 - 12 inches of weather barrier extended beyond corner to overlap.
- E. Apply wrap with grooved surface pattern in vertical direction.
- F. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.
- G. Shingle weather barrier over back edge of weep screed. Seal weather barrier with sealant or tape to weep screed. Ensure weeps are not blocked.
- H. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.
- I. Window and Door Openings: Extend weather barrier completely over openings.
- J. Weather Barrier Attachment:
 - 1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12 - 18 inches vertically on center along stud line, and 24 inches on center, maximum horizontally.
- K. Apply flashing membrane in accordance with manufacturer's recommendations, laid smooth without creases or bunches of material. Verify compatibility with adjacent materials prior to installation.
 - 1. Seam Overlap: As recommended by flashing manufacturer for application indicated.
 - 2. Flashing: As recommended by manufacturers published guides, industry standard installation methods, or project specific architectural details.
- L. To apply flashing, peel away the release sheet and press membrane firmly over substrate, applying sufficient pressure with a metal or wood roller along the entire membrane to ensure a continuous seal.

3.03 PROTECTION

- A. Protect installed weather barrier from damage.

END OF SECTION

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**SECTION 07 31 13
ASPHALT SHINGLES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for eave protection, underlayment, and valley protection.
- C. Flashing.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Roof sheathing.
- B. Section 07 21 00 - Thermal Insulation: Nailable rigid insulation.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim: Edge and cap flashings, gutters and downspouts.

1.03 REFERENCE STANDARDS

- A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- C. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2023.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).
- E. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing; 2016a (Reapproved 2021).
- F. ASTM D7158/D7158M - Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method); 2020.
- G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- H. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2020a.
- I. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021a.
- J. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments; 2023.
- K. NRCA (RM) - The NRCA Roofing Manual; 2025.
- L. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- M. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.
- C. Shop Drawings: For metal flashings, indicate specially configured metal flashings, jointing methods and locations, fastening methods and locations, installation details, and ____.
- D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern ; for color selection.
- E. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.
- B. Installer Qualifications: Company specializing in installing asphalt shingles, with at least 3 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver and store materials with labels intact in manufacturer's unopened packaging until ready for installation.
- C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.
- D. Protect materials from harmful environmental elements, construction dust, direct sunlight, and other potentially detrimental conditions.
- E. When storing roofing materials on roofing system ensure no damage occurs to supporting members and other materials.

1.07 FIELD CONDITIONS

- A. Do not install shingles, eave protection membrane, underlayment, or _____ when surface, ambient air, wind chill, or _____ temperatures are below 45 degrees F.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Asphalt Shingles:
 - 1. CertainTeed; Landmark PRO Solaris: www.certainteed.com/#sle.
 - 2. Owens Corning Corporation: www.owenscorning.com/en-us/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASPHALT SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
 - 1. Fire Resistance: Class A, complying with ASTM E108.
 - 2. Wind Resistance (Uplift): Class G, when tested in accordance with ASTM D7158/D7158M.
 - 3. Fire or Wind Resistance Criteria: Provide UL (DIR) listed and labeled products.
 - 4. Self-sealing type.
 - 5. Style: Square.
 - 6. Color: As selected by Architect.

2.03 SHEET MATERIALS

- A. Underlayment: Self-adhering, rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 45 mils, 0.045 inch total thickness; with strippable release film and woven polypropylene sheet top surface.
 - 1. Minimum Requirements: Comply with ICC-ES AC188.
 - 2. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
 - 3. Water Vapor Permeance: 0.067 perm, when tested in accordance with ASTM E96/E96M, Procedure A (desiccant method).
 - 4. Performance: Meet or exceed requirements for ASTM D226/D226M, Type II asphalt-saturated organic felt.
 - 5. Liquid Water Transmission: Passes ASTM D4869/D4869M.
 - 6. Functional Temperature Range: From minus 70 degrees F to 212 degrees F.

2.04 FLASHING

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, ridge vents, open valley flashing, chimney flashing, dormer flashing, and other flashing as indicated.
 - 1. Form flashings to profiles indicated on drawings.
 - 2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
 - 3. Hem exposed edges of flashings minimum 1/4 inch on underside.
 - 4. Coat concealed surfaces of flashings with bituminous paint.
- B. Steel Flashing: Prefinished and galvanized steel sheet, 26 gauge, 0.0179 inch minimum thickness, G90/Z275 hot-dip galvanized; PVC coated, color as selected.

2.05 ACCESSORIES

- A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8-inch head diameter, 12-gauge, 0.109-inch nail shank diameter, 1-1/2 inches long and complying with ASTM F1667/F1667M.
- B. Asphalt Roof Cement: ASTM D4586/D4586M, asbestos-free.
- C. Bituminous Paint: Acid and alkali resistant type; black color.
- D. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents.
- E. Plastic Ridge Vents: Extruded plastic with vent openings do not permit direct water or weather entry; flanged to receive shingles.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to starting this work.
- B. Verify roof deck is of sufficient thickness to accept fasteners.
- C. Verify roof penetrations and plumbing stacks are in place and flashed to deck surface.
- D. Verify roof openings are correctly framed.
- E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

- A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.
- B. Broom clean deck surfaces before installing underlayment.
- C. Protect surrounding areas and adjacent surfaces from damage during execution of this work.
- D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with roof cement, and secure flange with nails spaced ____ inches on center.

3.03 INSTALLATION

- A. Shingles:

1. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
 - a. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
 - b. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
2. Place shingles in straight coursing pattern with 5-inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
3. Project first course of shingles 3/4 inch beyond fascia boards.
4. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
5. After installation, place one daub of plastic cement 1-inch diameter under each individual shingle tab exposed to weather to prevent lifting.
6. Coordinate installation of roof mounted components or work projecting through roof with weathertight placement of counterflashings.
7. Complete installation to provide weathertight service.

3.04 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

3.05 PROTECTION

- A. Do not permit traffic over finished roof surface; protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged asphalt shingles or accessories before Date of Substantial Completion.

END OF SECTION

**SECTION 07 46 46
FIBER-CEMENT SIDING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Siding substrate.
- B. Section 07 25 00 - Weather Barriers: Water-resistive barrier under siding.
- C. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

- A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2022, with Editorial Revision (2023).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.
- D. Verification Samples: Submit two 12 inch x 12 inch samples of materials selected for use to verify profile, color, and finish.
- E. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).
- F. Manufacturer's qualification statement.
- G. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
- H. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.
- I. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified in this section with not less than three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.
- C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

- D. Protect materials from harmful environmental elements, construction dust, and other potentially detrimental conditions.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for years as indicated under Fiber-Cement Siding article sub-headings for "Warranty". Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

- A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Style: Standard lap style.
 - 2. Texture: Smooth.
 - 3. Length: 12 feet, nominal.
 - 4. Width (Height): 5-1/4 inches.
 - 5. Thickness: 5/16 inch, nominal.
 - 6. Finish: Unfinished.
 - 7. Color: As selected by Architect from manufacturers full range of available colors.
 - 8. Warranty: 50 year limited; transferable.
 - 9. Products:
 - a. James Hardie Building Products, Inc; ____: www.jameshardie.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Length (Height): 96 inches, nominal.
 - 2. Width: 48 inches.
 - 3. Thickness: 5/16 inch, nominal.
 - 4. Finish: Factory applied topcoat.
 - 5. Color: As selected by Architect from manufacturers full range of available colors.
 - 6. Warranty: 50 year limited; transferable.
 - 7. Products:
 - a. James Hardie Building Products, Inc; ____: www.jameshardie.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Texture: Smooth.
 - 2. Length: 96 inches, nominal.
 - 3. Width: 48 inches.
 - 4. Thickness: 5/16 inch, nominal.
 - 5. Finish: Factory applied topcoat.
 - 6. Color: As selected by Architect from manufacturers full range of available colors.
 - 7. Manufacturer: Same as siding.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

- B. Verify that water-resistant barrier has been installed over substrate completely and correctly; see Section 07 25 00.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Protect surrounding areas and adjacent surfaces during execution of this work.
- B. Install Sheet Metal Flashing:
 - 1. Above door and window trim and casings.
 - 2. Above horizontal trim in field of siding.

3.03 INSTALLATION

- A. Install siding in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with terms necessary to maintain warranty coverage.
 - 2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
 - 3. Use trim details as indicated on drawings.
 - 4. Touch up field cut edges before installing.
 - 5. Pre-drill nail holes if necessary to prevent breakage.
- B. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- C. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- D. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.
- E. Do not install siding less than 6 inches from ground surface, or closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- F. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

3.04 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean faced panels in accordance with manufacturer's maintenance instructions, using cleaning materials and methods acceptable to manufacturer.

3.05 PROTECTION

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

END OF SECTION

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**SECTION 07 62 00
SHEET METAL FLASHING AND TRIM**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Non-corrosive sheet metal and accessories for flashing, coping, counterflashing, reglet, gutter, and downspout fabrication.

1.03 REFERENCE STANDARDS

- A. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.

1.04 RELATED SECTIONS

- A. Section 07 41 13 – Metal Roof Panels
- B. Section 07 42 13 – Metal Composite Panels
- C. Section 07 54 23 – Thermoplastic Membrane Roofing.
- D. Division 8 - Openings.

1.05 SUBMITTALS

- A. Submit complete materials list of all items proposed to be furnished and installed under this section.
- B. Submit scaled shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter flashings, gutters, downspouts, and expansion joint systems, and interface of the work with the work of adjacent trades.

1.06 QUALITY ASSURANCE

- A. Quality Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in "Architectural Sheet Metal Manual", current edition, of the Sheet Metal and Air conditioning Contractors National Association (SMACNA).

1.07 JOB CONDITIONS

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

PART 2 – PRODUCTS

2.01 MATERIALS:

- A. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M minimum yield 50,000 psi, structural quality, Grade 50, Coating Class AZ50, 22-gauge minimum except as otherwise indicated.
- B. Solder: For use with steel, provide 50 - 50 tin/lead solder (((ASTM B32))), with rosin flux.
- C. Fasteners: Same metal as flashing and sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
 - 1. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
- D. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed; comply with Fed. Spec. TT-S-0027, TT-S-00230, or TT-S-001543.

- E. Reglets and Counterflashing: Metal units of type and profile indicated on drawings, compatible with flashing indicated, noncorrosive.
 - 1. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

2.02 FABRICATED UNITS

- A. Metal Fabrication:
 - 1. Shop-fabricate work to greatest extent possible.
 - 2. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices.
 - 3. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work.
 - 4. Form work to fit substrates.
 - 5. Comply with material manufacturer instructions and recommendations for forming material.
 - 6. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams not less than 3/4 inch wide, tin edges to be seamed, form seams, and solder.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water and weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic sealant concealed within joints.
 - 1. Provide expansion and contraction joints at not more than 40 foot intervals. Space joints evenly.
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer and/or fabricator.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual".
 - 1. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible and set units true to line and level as indicated.
 - 2. Install work such that all laps, joints, and seams will be permanently watertight and weatherproof.
- B. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- C. Install reglets to receive counter flashing in manner and by methods indicated.
- D. Install counterflashing in reglets by snap-in seal arrangement.
- E. Nailing will not be permitted through exposed faces of flashings.
- F. Install cleats for sheet metal items 18 inches and over in width. Fasten cleats evenly at 12 inches on center. Cleats shall be at least 2 inches wide, 3 inches long, and of the same material and thickness as the sheet metal being installed.

- G. Provide neoprene washers at exposed fastenings to protect sheet metal and form a watertight connection.
- H. Provide and install gutters and downspouts by methods indicated in the Drawings.

3.02 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

END OF SECTION

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SECTION 07 65 26
SELF-ADHERING SHEET FLASHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Application of self-adhering sheet membrane flashing tape.

1.02 RELATED SECTIONS

- A. Section 07 21 00 - Thermal Insulation
- B. Section 07 92 00 - Joint Sealants
- C. Section 08 10 00 - Doors and Frames
- D. Section 08 50 00 - Windows
- E. Section 09 24 00 - Cement Plastering

1.03 SUBMITTALS

- A. Comply with Section 01 30 00 – Administrative Requirements
- B. Submit manufacturer's product data and application instructions.
 - 1. QUALITY ASSURANCE
- C. Installer Qualifications: Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of self-adhesive membranes.
- D. Obtain self-adhesive flashing tape materials from a single manufacturer regularly engaged in manufacturing the product.
- E. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturer's instructions.
- C. Store adhesives and primers at temperatures of 40o F (5o C) and above to facilitate handling.
- D. Store membrane cartons on pallets
- E. Do not store at temperatures above 90o F (32o C) for extended periods.
- F. Keep away from sparks and flames.
- G. Completely cover when stored outside. Protect from rain
- H. Protect materials during handling and application to prevent damage or contamination.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Protect rolls from direct sunlight until ready for use.
- C. Allow a minimum of 24 hours for drying before installation after precipitation.
- D. Do not apply membrane when air or surface temperatures are below 25o F (-4o C).
- E. Do not apply to frozen surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. W. R. MEADOWS®, INC., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Web Site: www.wrmeadows.com.
- B. Substitutions per Section 01 25 00 Substitution Procedures.

2.02 MATERIALS

- A. Rolled, Self-Adhering Sheet Flashing Membrane: 25 mils 0.02 inch thick membrane consisting of self-adhesive rubberized asphalt membrane bonded to high density cross-laminated polyethylene carrier film, protected by release paper.
 - 1. 25 MIL flashing tape.

2.03 ACCESSORIES

- A. Primer: Provide primer compatible with flashing, per manufacturers recommendations
- B. Temperatures above 40o F (4o C): Water-Based Primer
- C. Temperatures below 40o F (4o C): Solvent-Based Primer.
- D. Pointing Mastic: Mastic for sealing penetrations and terminations of membrane.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive flashing tape. Notify architect if surfaces are not acceptable.
- B. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

- A. Protect adjacent surfaces not designated to receive self-adhering flashing tape.
- B. Clean and prepare surfaces to receive membrane in accordance with manufacturer's instructions.
 - 1. Do not apply flashing tape to surfaces unacceptable to manufacturer.
 - 2. All surfaces must be clean, smooth, and dry and must be clean of oil, dust, and excess mortar.
 - 3. Patch all holes and voids and smooth out any surface misalignments.
 - 4. Concrete surfaces must be cured for a minimum of 14 days.
 - 5. If curing compounds are used, they must be clear, resin-based, and without oil, wax, or pigments.

3.03 APPLICATION OF SELF-ADHERING FLASHING TAPE

- A. Cut flashing tape to desired length.
- B. Prime surfaces to be covered in one working day with applicable primer.
- C. Peel back the release paper to expose adhesive.
- D. Align the membrane and press into place with heavy hand pressure.
- E. Ensure laps are a minimum of 3" 2.95 inch.
- F. Mechanically fasten the membrane at all vertical terminations using only smooth shank fasteners
- G. Install the membrane so that the top membrane layer is over the bottom layer to ensure that all laps shed water.

3.04 PROTECTION

- A. Cover self-adhering sheet flashing as soon as possible, since it is not designed for permanent exposure.

END OF SECTION

**SECTION 07 92 00
JOINT SEALANTS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Sealants for interior and exterior applications.
- B. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. The entire extent of sealing work is not necessarily fully or individually described here or on the drawings. Refer to drawings for conditions and related parts of the work.

1.03 RELATED SECTIONS

- A. Division 01 Specification Sections apply to this Section.
- B. Division 07 Thermal and Moisture Protection Sections apply to this Section.
- C. Division 08 Openings Sections apply to this Section.
- D. Division 09 Finishes Sections apply to this Section.

1.04 ACTION SUBMITTALS

- A. Product Data: Provide a list of all materials intended for use on the Project. For each product provide:
 - 1. Manufacturer's specifications, recommendations, limitations, and installation instructions, including cleaning of joint surfaces and compatibility with other materials.
- B. Indicate location(s) of use for each product.
- C. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
- D. Samples for Color Selection for Exposed Sealants: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available.

1.05 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Certification that primer is not required for each substrate where primer is to be omitted.
- B. Materials Testing Reports confirming that materials meet specified standards.
- C. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
- D. Sealants, Waterproofing and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- E. Manufacturer Certificates: Signed by manufacturer, certifying that materials, substrates, and conditions specified for the Project comply with manufacturer's requirements. Include interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Sample warranty: Copy of manufacturer's warranty, stating obligation, remedies, limitations, and exclusions.

1.06 QUALITY ASSURANCE

- A. Material Compatibility: Sealant materials shall be compatible with one another and with other specified materials, under conditions of service and application required.

- B. VOC content of interior adhesives and sealants used shall comply with requirements of authorities having jurisdiction.
- C. Mockups: provide sealants for mockups.
- D. Source Limitations: Obtain each kind of joint sealant from a single source manufacturer.
- E. Manufacturer Qualifications: Company with at least 10 years documented experience in the manufacture of specified products and systems.
- F. Installer qualifications:
 - 1. Proper installation of sealants requires that installers be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.
 - a. For installation of sealants throughout the Work, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown on the Drawings and the installation requirements called for in this Section.
- G. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- H. Adhesion Tests: Manufacturer shall perform adhesion tests on substrates.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent material.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than or greater than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.09 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of joints sealants from the following:
 - 1. Movement of the structure caused by structural settlement or by errors attributable to design or construction, resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products indicated for each purpose in the sealant types below.
 1. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on field experience.
- B. Elastomeric Sealant Standard: Comply with ASTM C920 and other requirements indicated for each liquid applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C920 classification for type, grade, class, and uses.
- C. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C920 for uses indicated.
- D. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric joint-Sealant Schedule to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

2.02 ELASTOMERIC JOINT-SEALANTS

- A. Urethane: Multicomponent, pourable urethane joint sealant (self-leveling). Meets ASTM C920.
 1. Provide one of the following, but not limited
 - a. MasterSeal SL 2; BASF Corporation Construction Systems.
 - b. Chem-Calk 5550SL; Bostik, Inc.
 - c. Iso-Flex 880 GB; LymTal International.
 - d. Dynatrol II SG; Pecora Corporation.
 - e. Stampede-2SL; Sherwin-Williams Company.
 - f. THC 900/901; Tremco Inc.
 2. Type M, Grade P, Class 25.
 3. Use related to Exposure: T (traffic) and NT (non-traffic).
 4. Applications/ Locations: Ramps, driveways, sidewalk joints, parking decks, and industrial flooring.
- B. Silicone: Single component Neutral-curing, non-sag silicone sealant. Meets ASTM C920 .
 1. Provide one of the following, but not limited to:
 - a. SCS2700 Silfruf LM; GE Construction Sealants.
 - b. Sikasil WS-290; Sika Corporation.
 - c. Spectrem 2; Tremco Inc.
 2. Type S, Grade NS, Class 100/50.
 3. Use related to Exposure: NT (non-traffic).
 4. Use related to joint Substrate: M, G, A, O.
 5. Applications/ Locations: Control joints in precast concrete panels and metal curtain walls. Weather seal in glass-to-glass butt joint glazing, and weather seal in non-structural glazing applications, including cap, toe and heel beads.
- C. Silicone: Medium modulus elastomeric sealant for weatherproofing porous stone and metal panel substrates, ASTM C920 .
 1. Provide one of the following, but not limited to:

- a. 756 SMS; Dow Corning Corporation.
 - b. SilPruf NB; GE Construction Sealants.
 - c. 895 NST; Pecora Corporation.
 - d. Spectrum 3; Tremco Inc.
- 2. Type S, Grade NS, Class 50
- 3. Use related to Exposure: NT (non-traffic)
- 4. Use related to joint substrate: M, G, A, O.
- 5. Movement: Plus-minus 50 percent.
- 6. Applications/ Locations: Joints between natural stone, metal panels, perimeter seals around window frames.
- D. Silicone: Paintable sealant ASTM C920 .
 - 1. GE Paintable Silicone Supreme Window & Door Sealant or equivalent.
 - 2. Type S, Grade NS, Class 25
 - 3. se related to Exposure: NT (non-traffic).
 - 4. Use related to joint substrate: G, A, O.
 - 5. Applications/ Locations: windows, doors, siding, trim, decks, lattice, soffits, and vents.
- E. Low Modulus Nonacid-Curing Silicone Sealant: Where joint sealants of this type are indicated. Meets ASTM C920.
 - 1. Provide one of the following, but not limited to:
 - a. DOWSIL 790; Dow Corning.Silpruf; GE Silicones.864; Precora Corporation.Spectrem 1; Tremco Inc.
 - b. Silpruf; GE Silicones.
 - c. 864; Precora Corporation.
 - d. Spectrem 1; Tremco Inc.
 - 2. Color: Match architect's samples(s) or Architect will select from the standard range of colors from the sealant manufacturer.
 - 3. Type S, Grade NS, Class 100/50,
 - 4. Use related to Exposure: NT (non-traffic).
 - 5. Uses Related to Joint Substrates: M (Mortar), G (Glass), A (Aluminum), O (Other).
 - 6. Applications: Exterior, horizontal and vertical joints.
- F. Mildew-Resistant joint sealant: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth. Meets ASTM C920.
 - 1. Provide one of the following, but not limited to:
 - a. 786-M White; Dow Corning Corporation.
 - b. SCS 1700 Sanitary;
 - c. GE Construction Sealants.
 - d. Tremsil 200; Tremco Inc.
 - 2. Type S, Grade NS, Class 25.Use related to Exposure: NT (non-traffic).Use related to joint substrate: A, G, O.Applications/ Locations: Around fixtures in restrooms, locker rooms, swimming pool facilities and lavatories.
 - 3. Use related to Exposure: NT (non-traffic).
 - 4. Use related to joint substrate: A, G, O.Applications/ Locations: Around fixtures in restrooms, locker rooms, swimming pool facilities and lavatories.
 - 5. Applications/ Locations: Around fixtures in restrooms, locker rooms, swimming pool facilities and lavatories.
- G. Foam-in-place Gap Sealer:
 - 1. Minimal expanding, single component polyurethane in aerosol cans; "Great Stuff" or "Great Stuff Pro" by Dupont or accepted equal.
 - a. Sealer shall be UL listed as Class 1 sealant.
 - b. Sealer shall conform to recommendations included in AAMA-812-04.
 - c. Applications/ Locations: Filling gaps between window/door frames and walls, non-rated penetrations, etc.

2.03 ACOUSTICAL JOINT SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, non-staining, non-hardening, paintable latex sealant complying with ASTM C834 and the following:
 - 1. ASTM E90 - Products effectively reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies.
 - 2. Subject to compliance, but not limited to:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.04 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density of control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or Silicone tubing complying with ASTM D 1056, non-absorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Braker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.05 MISCELLANEOUS MATERIALS

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

2.06 MATERIALS - COLORS

- A. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- B. Concealed Sealants: Manufacturer's standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil grease, waterproofing, water repellants, water, surface dirt, and frost.
2. Clean, porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile
 - d. Stone tile.
3. Remove laitance and form-release agents from concrete.
4. Clean, nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion. Non-porous joint surfaces include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that would otherwise be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Non-Sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 1. Remove excess sealants from surfaces adjacent to joint.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.04 JOINT DIMENSIONS

- A. Joint dimension shall be as shown on the drawings. In joints up to 1/4 inch wide the depth of the sealant shall be the same as the joint width.
- B. In open joints over 1/4 inch wide, the depth of the sealant shall be approximately one-half the width of the joint, but in no case less than 1/4 inch deep.
- C. When open joints exceed the depth requirements, insert backup material to the necessary depth stated above. If not, place bond breaker tape in bottom of joint.
 - 1. When perimeter joints around frames that are to be sealed do not have built-in stops, insert backup material to provide a joint with a minimum depth of 3/8 inch and a maximum depth of 1/2 inch.

3.05 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed, and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1,000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1,000 feet of joint length thereafter or one test per each floor per elevation.
 - 2. Test Method: Test joint sealants by hand-pull method described below:
 - a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross-cut at one end. Place a mark 1 inch cross-cut end of the 2-inch piece.
 - b. Use fingers to grasp the 2 inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler alongside of sealant. Pull sealant out of the joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
 - c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.06 MISCELLANEOUS SEALING WORK

- A. The entire extent of sealing work is not necessarily fully or individually described herein. Sealing shall be provided wherever required to prevent moisture, sound and/or light leakage. Refer to drawings for conditions and related parts of the work.
- B. All penetrations and openings in exterior walls shall be sealed in compliance with CBC Title 24 standards.

3.07 PROTECTION

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

3.08 CLEANING

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

END OF SECTION

SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

GENERAL

1.01 SECTION INCLUDES

- A. Adhered TPO membrane roofing system.
- B. Cover board.
- C. Roof insulation (crickets).

1.02 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry for wood nailers, cants, curbs, and blocking and for wood-based, structural-use roof deck panels.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim for flashings and counter flashings.
- C. Section 33 41 00 - Storm Utility Drainage for roof drains.

1.03 REFERENCES

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- D. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.
- F. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).
- G. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- H. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2023).
- I. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2016a (Reapproved 2023).
- J. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012 (Reapproved 2022).
- K. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.
- L. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method; 1983 (Reapproved 2018).
- M. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2022.
- N. ASTM D4601/D4601M - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing; 2004 (Reapproved 2020).
- O. ASTM D6163/D6163M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements; 2021.
- P. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.
- Q. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

- R. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).
- S. FM (AG) - FM Approval Guide; Current Edition.
- T. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2024).
- U. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; 2016, with Editorial Revision (2022).
- V. NRCA (RM) - The NRCA Roofing Manual; 2025.
- W. NRCA (WM) - The NRCA Waterproofing Manual; 2021.
- X. UL (DIR) - Online Certifications Directory; Current Edition.
- Y. UL (FRD) - Fire Resistance Directory; Current Edition.
- Z. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.
- AA. Sheet Metal Terminology and Techniques: SMACNA "Architectural Sheet Metal Manual."

1.04 DESIGN CRITERIA

- A. General: Installed roofing membrane system shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.
- C. Installer shall comply with current code requirements based on authority having jurisdiction.
- D. Wind Uplift Performance: Roofing system shall meet the intent of systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE 7.
- E. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; UL 790, for application and roof slopes indicated.

1.05 SUBMITTALS

- A. Product Data: Manufacturer's data sheets for each product to be provided.
- B. Detail Drawings: Provide roofing system details and details of attachment to other work, including:
 - 1. Base flashings and membrane terminations.
 - 2. Crickets, saddles, and tapered edge strips, including slopes.
 - 3. Insulation fastening and adhesive patterns.
 - 4. Walkway rolls.
 - 5. All materials to provide a complete system.
- C. Installer Certificates: confirmation that installer is approved, authorized, or licensed by manufacturer to install roofing system.
- D. Maintenance Data: Refer to manufacturers latest published documents.
- E. Warranty: Provide manufacturer's current warranty specimen.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and who is eligible to receive the specified manufacturer's warranty.
- B. Manufacturer Qualifications: Qualified domestic U.S. owned and based manufacturer that has UL listing or accredited testing agency listing for roofing system identical to that used for this Project.
- C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 329.
- D. Test Reports:
 - 1. Roof drain and leader test or submit plumber's verification.
 - 2. Roof deck fastener pullout test.
- E. Source Limitations: Obtain all components from the single source roofing manufacturer warranting the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.08 PROJECT CONDITIONS

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

1.09 WARRANTY

- A. Provide manufacturer's system warranty.
 - 1. Single-source special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, adhesives, cover board, walkway products, manufacturer's edge metal products, and other approved single-source components of roofing system marketed by the manufacturer.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
 - 3. Contractor is required to list "COAR Design Group" as the Specifier of record in the appropriate fields ("Specifier Account") when applying for the manufacturer's warranty.
- B. Installer's Warranty: Submit roofing Installer's warranty, including all components of roofing system for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE - TPO

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D6878/D6878M, uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced.
 - 1. Membrane Thickness: 60 mils (1.52 mm), nominal
 - 2. Exposed Face Color: Architect to select from Manufacturer's Standard colors.

- B. Manufacturers:
 - 1. GAF: EverGuard; www.gaf.com
 - 2. Carlisle: Syntech; www.carlislesyntec.com
- C. Substitutions: Per Section 01 25 00 Substitution Procedures.

2.02 AUXILIARY ROOFING MATERIALS – SINGLE PLY

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
 - 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's internally reinforced or scrim reinforced. TPO 60 mil
- C. Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for TPO membrane.
 - 1. Serviceable Installation Ambient Air Temperature: 40°F and rising
- D. Flashing Adhesive: Manufacturer's standard-solvent- based, spray applied bonding adhesive for base flashings.
 - 1. Serviceable Installation Ambient Air Temperature: 25°F and rising.
- E. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors.
- F. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- G. Walkway rolls, 140-mil extruded and embossed TPO.
- H. Miscellaneous Accessories: Provide all accessories to meet the roofing manufacturer's warranty requirements.

2.03 COVER BOARD

- A. Gypsum Board: ASTM C1177, Heavy duty coated glass-mat facer with Eonic primed face, water-resistant gypsum substrate for adhered roof applications, 1/4 inch (6 mm) thick. Basis of design: Dens Deck Prime Roof Board

2.04 TAPERED INSULATION / CRICKETS

- A. Tapered Insulation: ASTM C 1289, Type II, Class 1, Grade 2 (20 psi), provide factory-tapered insulation boards fabricated to slope indicated on drawings.

2.05 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Provide saddles, crickets, tapered edge strips, and other insulations shapes where indicated for sloping to drain. Fabricate to slopes indicated. Basis of design: Tapered Fesco Edge Strips.
- C. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and furnished by roofing system manufacturer.
- D. Wood Nailer Strips: Comply with requirements in Division 06 Section "Rough Carpentry."
- E. Scuppers: Coordinate with drawings and details.

2.06 EDGE METAL COMPONENTS

- A. Metal Edge System: Manufacturer's clad metal edge system used to terminate the roof at the perimeter of the structure. Provide product from single-source roofing system supplier that is included in the No Dollar Limit warranty.

- B. Shop-Fabricated Edge Metal: Custom-fabricated edge metal meeting the criterion of ANSI/SPRI ES-1. Must be approved by manufacturer technical representative. Minimum requirements:
 - 1. Steel: 24 gauge, TPO coated fastened 6 inches on center.
 - 2. Aluminum: 0.05 inch thick, fastened 6 inches on center.
- C. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim", and per drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with the requirements affecting performance of roofing system.
 - 1. General:
 - a. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 - b. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 2. Wood Decks:
 - a. Verify that wood decking is visibly dry and free of moisture.
 - b. Verify that wood has ability to provide minimum fastener pull-out resistance.
 - 1) Provide documentation of pull-out resistance values in accordance with ANSI/SPRI FX-1 2016.
 - 3. Ensure general rigidity and proper slope for drainage.
 - 4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units more than 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
- B. Unacceptable panels should be brought to the attention of the General Contractor and Project Owner's Representative and shall be corrected prior to installation of roofing system.

3.02 PREPARATION

- A. Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.
- C. If applicable, prime surface of deck at a rate recommended by roofing manufacturer and allow primer to dry.
- D. Proceed with each step of installation only after unsatisfactory conditions have been corrected.

3.03 INSULATION INSTALLATION

- A. Coordinate installation of roof system components so insulation and cover board are not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installation of roof insulation and cover board.
- C. Install tapered crickets under area of roofing to conform to slopes indicated.
- D. Install insulation boards with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer's written instructions. Fill gaps exceeding 1/4 inch (6 mm) with like material.
- E. Loose Laid Insulation: Loose lay all layers of insulation with staggered joints.

3.04 COVER BOARD INSTALLATION

- A. Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.
- C. Install cover board with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer's written instructions. Fill gaps exceeding 1/4 inch (6 mm) with cover board.
 - 1. Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- D. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
 - 1. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- E. Mechanically Fastened Cover Board: Install cover board and secure to deck using mechanical fasteners designed and sized for fastening specified cover board to deck type.
 - 1. Fasten to resist uplift pressure at corners, perimeter, and field of roof.

3.05 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.
- B. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- C. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.06 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing in accordance with membrane roofing system manufacturer's written instructions.
 - 1. Unroll roofing membrane and allow to relax before installing.
 - 2. Install sheet in accordance with roofing system manufacturer's written instructions.
- B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Water Based Bonding Adhesive for smooth backed membranes: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- D. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- E. Apply roofing membrane with side laps shingled with roof slope, where possible.
- F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - a. Remove and repair any unsatisfactory sections before proceeding with installation.

- 3. Repair tears, voids, and incorrectly lapped seams in roofing membrane that do not meet requirements.
- G. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.07 BASE FLASHING INSTALLATION

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

3.08 EDGE METAL INSTALLATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Provide edge details as indicated on the Drawings. Install in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."
- C. Join individual sections in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."

3.09 FIELD QUALITY CONTROL

- A. Owner or designated representative will provide on-site observation and inspection during installation.
- B. Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- D. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTION AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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**SECTION 07 72 33
ROOF HATCHES**

PART 1 GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Provide factory-fabricated roof hatches for ladder access.
 - 2. Provide factory-fabricated and finished fixed hatch railing system.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.
- B. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).

1.03 SUBMITTALS

- A. Submittals: Per Section 01 30 00 - Administrative Requirements
- B. Product Data: Submit manufacturer's product data.
- C. Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions compatible with roof structure at location(s) shown in the drawings.
- D. Submit copy of Manufacturer's standard warranty with product data.

1.04 QUALITY ASSURANCE

- A. Manufacturer: A minimum of 5 years experience manufacturing similar products.
- B. Installer: A minimum of 2 years experience installing similar products.
- C. Manufacturer's Quality System: Registered to ISO 9001 Quality Standards including in-house engineering for product design activities.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

1.06 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.
- B. Submit executed copy of manufacturer's standard warranty per Section 01 78 36 Warranties.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Basis-of-Design Manufacturer: roof hatch by The BILCO Company, New Haven, CT, www.BILCO.com, or equal. Subject to compliance with all local requirements.

2.02 ROOF HATCH

- A. Furnish and install where indicated on plans, metal roof hatch Type S, size width: 36" x length: 30". Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.
- B. Performance characteristics:
 - 1. Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m²) with a maximum deflection of 1/150th of the span and a maximum design pressure of +/- 100 PSF (488 kg/m²) with a design factor of 2 for galvanized steel (Type S-20) and aluminum

- (Type S-50) roof hatches or 20 psf (97 kg/m²) for stainless steel (Type S-90) roof hatches or roof hatches with an aluminum cover and galvanized steel curb (Type S-40)].
2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 3. Operation of the cover shall not be affected by temperature.
 4. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.
 5. Galvanized steel (Type S-20) and aluminum (Type S-50) roof hatches shall have a valid Notice of Acceptance (NOA) by Miami-Dade County Product Control Section. This product certification approves use in a High Velocity Hurricane Zone (HVHZ).
- C. Cover: Shall be 14 gauge stainless steel with a 3" beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
- D. Cover insulation: Shall be fiberglass of 1" thickness, fully covered and protected by a metal liner 22 gauge galvanized steel.
- E. Curb: Shall be 12" in height and of 14 gauge galvanized steel. The curb shall be formed with a 3-1/2" flange with 7/16" holes provided for securing to the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6" on center, to be bent inward to hold single ply roofing membrane securely in place.
- F. Curb insulation: Shall be rigid, high-density fiberboard of 1" thickness on outside of curb.
- G. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe through bolted to the curb assembly.
- H. Hardware
1. Heavy pintle hinges shall be provided.
 2. Cover shall be equipped with a spring latch with interior and exterior turn handles.
 3. Roof hatch shall be equipped with interior and exterior padlock hasps.
 4. The latch strike shall be a stamped component bolted to the curb assembly.
 5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" diameter red vinyl grip handle to permit easy release for closing.
 6. All hardware shall be zinc plated and chromate sealed.
 7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.
- I. Finishes: Factory finish shall be alkyd based red oxide primed steel.

2.03 HATCH RAIL SYSTEM

- A. Furnish and install where indicated on plans hatch rail system compatible with Roof Hatch.
- B. Performance characteristics:
1. High visibility safety yellow powder coat paint finish (other colors available as a special order).
 2. Hatch rail system shall attach shall not penetrate any roofing material.
 3. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.29 and shall meet OSHA strength requirements with a factor of safety of two.
 4. Corrosion resistant construction with a five-year warranty.
 5. Hinged gate shall ensure continuous barrier around the roof hatch.
 6. Self-closing gate hinge and positive latching system provided with hatch rail system.
 7. Posts and Rails: 1-1/4" 6061 T6 schedule 40 aluminum pipe.

- C. Hardware: Mounting brackets shall be 3/8" (9mm) thick extruded aluminum. Pivoting post guides with compression fittings and latching mechanism shall be cast aluminum. Self-closing hinges and all fasteners shall be type 316 stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.
 - 1. Test units for proper function and adjust until proper operation is achieved.
 - 2. Repair finishes damaged during installation.
 - 3. Restore finishes so no evidence remains of corrective work.

3.03 ADJUSTING AND CLEANING

- A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

END OF SECTION

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**SECTION 07 84 00
FIRESTOPPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- A. Section 01 35 10 - Sustainability (CALGreen) Requirements
- B. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.
- C. Section 07 92 00 - Joint Sealants.
- D. Section 09 29 00 - Gypsum Board.

1.03 REFERENCE STANDARDS

- A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- C. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- D. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.
- E. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.
- F. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.
- G. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus; 2025.
- H. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a.
- I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).
- K. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- L. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Certificate from authority having jurisdiction indicating approval of materials used.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.
 - 2. Verification of minimum three years documented experience installing work of this type.
 - 3. Licensed by local authorities having jurisdiction (AHJ).

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Install one firestopping assembly representative of each fire rating design required on project.
 - 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
- C. If accepted, mock-up will represent minimum standard for this work.
- D. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products; _____: www.3m.com/firestop/#sle.
 - 2. Hilti, Inc; _____: www.hilti.com/#sle.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- D. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING SYSTEMS

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

- A. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

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

END OF SECTION

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**SECTION 07 21 00
THERMAL INSULATION**

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Thermal insulation batts.
 - 2. Sound attenuation batts.
 - 3. Rigid insulation boards.

1.02 RELATED SECTIONS

- A. Contracting Requirements, and Division 01 General Requirements apply to the Work of this Section.
- B. Section 06 10 00 – Rough Carpentry
- C. Section 07 65 26 - Self Adhering Flashing Tape
- D. Section 07 25 00 – Weather Barriers
- E. Section 07 92 00 - Joint Sealants
- F. Section 09 29 00 - Gypsum Board Assemblies

1.03 REFERENCE STANDARDS

- A. ASTM C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation; 2022.
- B. ASTM C272/C272M - Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions; 2018.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.
- G. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- I. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.
- J. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 QUALITY ASSURANCE

- A. Provide insulation and related materials with the fire test response characteristics indicated, as determined by testing identical products per ASTM E84, for surface burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Identify materials with appropriate markings of applicable testing and inspecting agency.
- B. Recycled Content: Provide glass fiber insulation with recycled content so post-consumer recycled content plus one half of pre-consumer recycled content constitutes a minimum of 40% by weight.

1.05 INFORMATIONAL SUBMITTALS

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
Thermal Insulation
07 21 00 -1

- A. Submit under the provisions of Section 01 30 00 – Administrative Requirements.
- B. Product Data: For each type of product indicated.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- D. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.
- E. Maintenance Data.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Meet all required insulation values required by the local AHJ and designed in the drawings, including but not limited to:
 - 1. Thermal R-values, acoustic requirements, fire-rated assemblies and wall/floor/ceiling penetration requirements.
 - 2. Labeling: Provide identification mark indicating R-value of each piece of insulation 12 inches and wider in width.
- B. Insulation shall comply with the 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."

2.02 FOAM-PLASTIC BOARD INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1 or 2, with maximum flame spread and smoke developed indexes of 75 and 450, respectively, based on tests performed on un-faced core on thicknesses up to 4 inches. Meets CBC requirements for foam plastic insulation. R Value to meet requirements in the drawings.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc Tuff-R or equal.
- B. Properties:
 - 1. Thickness: As indicated in drawings.
 - 2. Edge: Square.
 - 3. Compressive Strength: 25 psi minimum in accordance with ASTM D1621.
 - 4. Flexural Strength: 55 psi minimum in accordance with ASTM C203.
 - 5. Vapor Permeance: 0.04 perms maximum in accordance with ASTM E96.
 - 6. Water Absorption: 0.01 percent by volume maximum in accordance with ASTM C272.
 - 7. Thermal Resistance: 6.5 sq. ft. x h x deg F/Btu at 1 inch thickness, minimum in accordance with ASTM C518. Should be minimum R30 for the roof.
 - 8. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 9. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
 - 10. Labeling: Provide identification of mark indicating R-Value of each piece of insulation 12 inches and wider in width.
 - 11. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.03 XPS BOARD INSULATION:

- A. Extruded Polystyrene Complies with ASTM C578, Type IV with patented carbon-black technology wall insulation system placed over wall board sheathing or wall substrates of masonry veneer cavity walls and with seam treatment to form a continuous thermal, air, and water barrier system.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc; Styrofoam Brand Ultra SL: building.dupont.com/#sle or equal.
- C. Properties:
 - 1. Thickness: As indicated in drawings.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.

3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Compressive Resistance: At least 25 psi.
5. Density: At least 1.45 lbs/cu ft.
6. Water Vapor Permeance: Maximum of 1.5 perms per 1 inch thickness.
7. Water Absorption: Maximum of 0.3 percent by volume by total immersion.
8. Board Overall Dimensions: 48 inch wide by 96 inch long.
9. Thermal Resistance (R-value): At least 10, for board thickness indicated at 75 degrees Fahrenheit.

2.04 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or of an equal quality:
 1. CertainTeed Insulation.
 2. Johns Manville
 3. Owens Corning.
- B. Where glass-fiber blanket insulation is indicated by thickness or function, provide blankets in batt or roll form with thermal resistances indicated in the drawings.
 1. Un-faced, Glass-Fiber Blanket Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame spread and smoke developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
 2. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C665, Type III (blankets with reflective membrane facing), Class A, membrane faced surface with a flame spread index of 25 or less; Category 1 (membrane is a vapor barrier), faced with foil scrim draft, foil scrim, or foil scrim polyethylene on one face.
 3. Polyscrim-Kraft faced, Glass-Fiber Blanket Insulation: Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.

2.05 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.
- C. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive. Application: Sealing of interior circular penetrations, such as pipes or cables.
- D. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.
- E. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with high performance adhesive, polyester fiber top sheet.
- F. Rigid Insulation Pronged Attachment Washers: Solid plastic cap washer with prongs and flexible perimeter seal attached with screws to substrate for attachment of rigid insulation and to help seal against air and moisture penetration through weather barrier assembly.

2.06 INSULATION FASTENERS

- A. Pointed Rods.
- B. Insulation Standoff: Spacer fabricated from galvanized mild steel sheet for fitting over spindle of insulation anchor to maintain air space of 2 inches between face of insulation and substrate to which anchor is attached.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 EXECUTION

3.01 PREPARATION

Issued for Construction
 Newport Beach Fire Station No. 1 and Library
 Newport Beach, California

02/05/2026
 Thermal Insulation
 07 21 00 -3

- A. Clean substrates of substances that are harmful to insulation or that interfere with full insulation coverage.
- B. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.02 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelope entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove unnecessary projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
 - 1. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are set into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
 - 2. Glass-Fiber: Install in cavities formed by framing members according to the following requirements:
 - a. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - b. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - c. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - d. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - e. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - f. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - 1) With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 - g. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - 3. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation.

3.04 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thickness indicated. Extend insulation 48 inches up either side of partitions.

END OF SECTION

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**SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hollow-metal doors and frames.

1.02 RELATED DOCUMENTS

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

1.03 RELATED SECTIONS

- A. Section 07 92 00 – Joint Sealants.
- B. Section 08 14 16 – Flush Wood Doors.
- C. Section 08 71 00 – Door Hardware.
- D. Section 08 80 00 – Glazing.
- E. Section 09 91 00 – Painting.

1.04 REFERENCE STANDARDS

- A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

1.05 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with history of successful production acceptable to the Architect.
- B. Comply with "Recommended Specifications, Standard Steel Doors and Frames", SDI 100, by the Steel Door Institute.
- C. Comply with applicable accessibility criteria (e.g. ADA, CBC Chapter 11B).

1.06 SUBMITTALS

- A. Submit all information per Section 01 30 00 – Submittals.
- B. Manufacturer's data - Submit the following:
 - 1. Complete materials list of all items proposed to be furnished and installed under this Section.
 - 2. Shop Drawings showing details of each frame type, elevations of each door design type, details of all openings, and all details of construction, installation, and anchorage.
 - 3. Submit Certification indicating that the product meets the requirements of NFPA 80 for Fire Rated Doors.
 - 4. Coordinate door and frame submittal with Finish Hardware as specified in
 - 5. Section 08 71 00 – Door Hardware.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Supports and Anchors: Fabricate of not less than 18-gauge galvanized sheet steel.
- B. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into concrete or masonry walls, complying with ASTM A153, Class C or D as applicable.
- C. Shop Applied Paint: Use rust-inhibitive baked enamel or paint, suitable as a base for specified finish paints.

2.02 FABRICATION

- A. Comply with SDI 100 for minimum materials and construction requirements.

- B. Exposed Fasteners: Provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.
- C. Finish Hardware Preparation:
 - 1. Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115.
 - 2. Reinforce hollow metal units to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at site.
 - 3. Locate finish hardware in accordance with "Recommended Locations for Builders Hardware", published by the National Builders Hardware Association.
- D. Security Access: Coordinate door installation with security access controls specified herein and/or required by the County.

2.03 SHOP PAINT

- A. Clean, treat and paint exposed surfaces of fabricated hollow metal units.
- B. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before the application of the shop coat of paint.
- C. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive field applied finish.
- D. Finish Coat: As specified for field finishing per Section 09 91 00 – Painting. Color per schedule in the drawings.

2.04 DOORS

- A. Materials: Commercial quality, stretcher leveled, cold rolled steel conforming to ASTM A366 or hot rolled steel, pickled and oiled conforming to ASTM A569, free from scale, pitting or surface defects; with edges, angles and corners square.
- B. Construction: Doors shall be full flush type or panelized type as indicated, 1-3/4 inch thick, fabricated from steel sheets, 16-gauge at exterior doors, 18-gauge at interior doors. Top and bottom edges to be flush and closed with minimum 16-gauge channels at exterior doors and 18-gauge channels at interior doors. All edges shall be full seam welded.
- C. Fire Rated Doors shall be labeled and comply with the requirements of NFPA 80.
- D. Internal Construction: Vertical and/or horizontal steel rigidly formed members welded to the face panels with sound deadening material filling all interior hollow spaces; or polyurethane, polystyrene or mineral core bonded to the inside of both faces.
- E. Glazing: Provide minimum 20-gauge glazing stops on the outside of exterior doors, and the corridor side of interior doors. Glazing beads on the inside shall be removable. Glazing is specified in Section 08 80 00 Glazing.
- F. Louvers: Louvers for doors shall be inverted Y type. Weld or tenon louver blades to frame and fasten the entire louver assembly to the door with moldings. Moldings on the inside shall be detachable.
- G. Mouldings on the outside shall be an integral part of the louver. Form louvers of 16-gauge steel. On exterior doors provide metal framed insect screens rigidly secured to louvers to permit ready removal. Louvers shall have a minimum of 50 percent net-free opening.

2.05 STEEL FRAMES

- A. Provide metal frames of the types and styles indicated on the Drawings or schedules and complying with SDI 100 for minimum materials and construction requirements.
- B. Frames shall be Fire Rated to comply with the requirements of NFPA 80.

- C. Fabricate frames of welded construction; exterior 14-gauge, interior 16-gauge. Miter all corners. Reinforce all hinge pockets with additional hinge reinforcement straps.
- D. Door Silencers: Provide 3 silencers on strike jambs of frames.
- E. Anchors: Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18-gauge.
- F. Wall Anchors: Provide a minimum of three anchors for each jamb. Locate anchors opposite top and bottom hinges and midway between.
- G. Stud Partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to metal studs.
- H. Concrete/Masonry Walls: Install frames using anchors as recommended by the frame manufacturer for concrete installation.

2.06 INFILTRATION/EXFILTRATION

- A. When measured in accordance with ASTM E 283-73, doors shall not have an infiltration rate in excess of 0.5 cfm/sq. ft. per single doors or 1.0 cfm per sq. ft. per double door when subject to a pressure differential equivalent to that of a 25 mph wind.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install metal doors, frames, and accessories in accordance with manufacturer's data, and as specified herein.
- B. Setting Frames:
 - 1. Comply with the provisions of SDI 100, unless otherwise indicated.
 - 2. Set frames prior to construction of enclosing walls. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 - 3. When installed in prepared openings, install sealant between frame and wall in compliance with the requirements of Section 07 92 00 – Joint Sealants.
- C. Door Installation:
 - 1. Fit doors accurately in their respective frames, within clearances specified in SDI 100.
 - 2. Clearance: Unless indicated otherwise, for non-rated doors provide clearances of 1/8-inch at jambs and heads; 1/8-inch at meeting stiles for pairs of doors; and 1/4-inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch clearance from bottom of door to top of threshold.
- D. Security Access: Coordinate door installation with security access controls indicated herein and/or required by the County.

3.03 ADJUST AND CLEAN

- A. Final adjustments: check and readjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper operating condition.
- B. Remove and replace defective work, including doors or frames which are warped, bowed, or otherwise damaged.
- C. Finish Coat Touch-up: Immediately after erection, sand smooth all rusted or damaged areas of prime coat and apply touch-up of compatible air-drying paint.
- D. Painting of Metal Doors and Frames is specified in Section 09 91 00 – Painting.

END OF SECTION

**SECTION 08 31 00
ACCESS DOORS AND PANELS**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 09 21 16 - Gypsum Board Assemblies

1.02 SECTION INCLUDES

- A. Flush door access panels for ceilings and walls.

1.03 SUBMITTALS

- A. Manufacturer's Data to describe and illustrate each accessory at large scale and show installation method including requirement for blocking and backing, by others.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pack accessories individually in a manner to protect accessory and its finish.
- B. Protect adjacent or adjoining finished surfaces and work from damage during installation of work of this section.

PART 2 – PRODUCTS

2.01 FLUSH DOOR ACCESS PANELS

- A. Manufacturers: Subject to compliance with requirements, provide access panels manufactured by Milcor, JL Industries, Larsen's Manufacturing Co., or equal.
 - 1. Flush Door Access Panels for Drywall Ceilings and Walls: Milcor Style DW flush panel access door, 16-gauge frame, 16-gauge door panel. Lock shall be flush, screwdriver-operated with steel cam.
 - a. Finishes: Satin stainless steel.
 - 2. Fire Rated Drywall Bead Access Door: Milcor Style UFR-DW. Door is 20 gauge cold-rolled steel sandwich panel with 2" mineral fiber insulation. Frame is 16-gauge cold-rolled steel, 4-piece frame with galvanized steel drywall bead, masonry anchors. Self-latching paddle latch and locking system with key-operated cylinder lock.
 - a. Finishes: Prime Paint to match wall or ceiling.

2.02 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Deliver inserts and rough-in frames to jobsite at appropriate time for building-in. Provide templates and rough-in measurements as required.
- B. Examine the areas and conditions under which materials are to be placed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- C. Verify that required solid blocking and backing is provided as necessary for installation of specified units.

3.02 INSTALLATION

- A. Install all items true, plumb, and level, securely and anchored to substrate.

3.03 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation.

- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION

**SECTION 08 33 23
OVERHEAD COILING DOORS**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes overhead coiling doors, activation devices and accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Verify the work of this Section with project conditions for compliance with Contract Documents.
- B. Regulatory Agency Approvals: Items requiring electrical connection in this section shall be listed and classified by UL/ULC or testing firm acceptable to Authorities Having Jurisdiction as suitable for purpose specified.

1.03 RELATED SECTIONS

- A. Section 01 25 00 - Substitution Procedures
- B. Section 09 91 00 – Painting
- C. Section 26 00 00 – Electrical, coordinate electrical requirements

1.04 QUALITY ASSURANCE

- A. Furnish all materials, services, testing, transportation and equipment necessary for and reasonably incidental to the completion of all work of this section, as indicated on drawings and specified herein.
- B. Work, materials and equipment not indicated or specified which is necessary for a complete and proper operation of the work of this Section in accordance with the true intent and meaning of the Contract Documents shall be provided and incorporated at no additional cost to the Owner.
- C. Furnish each overhead sectional door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.
- D. Wind Loading: Design and reinforce overhead sectional doors to withstand wind loading pressure per local requirements, unless otherwise indicated.
- E. Installation: Engage companies specializing in performing work of the type specified in this section and authorized by manufacturer.
- F. Coordinate coiling door's operating controls with activation devices and specified accessories.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of overhead sectional door. Include electrical requirements, operating instructions and maintenance information.
- B. Submit 4" x 4" color samples for finish indicated.
- C. Shop Drawings: Submit shop drawings for special components and installations which are not fully dimensioned or detailed on manufacturer's data sheets.

PART 2 – PRODUCTS

2.01 OVERHEAD COILING (ROLLING) DOORS

- A. App Bay Door Manufacturer: Overhead Door Corporation, provide Model 998 rolling service door or approved equal.
 - 1. Model 998 – 22 ga.; electric operator.
 - 2. Subject to compliance with all requirements,
- B. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats designed to withstand required wind loading, of continuous length for width of door without splices. Unless

otherwise indicated, provide slats of material gage recommended by the manufacturer for size and type of door required, and as follows:

1. Steel Door Curtain Slats: Structural quality, cold-rolled galvanized steel sheets complying with ANSI/ASTM A 446, Grade A, with G90 zinc coating, complying with ASTM A 525, and phosphate treated before fabrication.
 - a. Furnish manufacturer's standard "flat-face" slats.
 - b. Provide curtain slats with factory finished, baked-on epoxy prime coat and with baked on fluoropolymer finish coat.
 - c. Color: As indicated on finish schedule.
 2. Endlocks: Malleable iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets. Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement.
 3. Windlocks: Malleable iron castings secured to curtain slats with galvanized rivets. Space windlocks approximately 24" o.c. on both edges of curtain.
 4. Bottom Bar: Consisting of 2 angles, each not less than 2" x 2" x 1/8" thick, galvanized steel.
 - a. Provide a replaceable gasket of flexible vinyl or neoprene between angles as a weather seal and cushion bumper for manually operated doors unless shown as an overlapping joint or specified otherwise.
 5. Curtain Jamb Guides: Fabricate curtain jamb guides of minimum 3/16" steel angles, or channels and angles with sufficient depth and strength to retain curtain loading. Build-up units with minimum 3/16" thick steel sections, galvanized after fabrication. Slot bolt holes for track adjustment.
 - a. Secure continuous wall angle to wall framing by 3/8" minimum bolts at not more than 30" o.c., unless closer spacing recommended by door manufacturer. Extend wall angles above door opening head to support coil brackets, unless otherwise shown. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position. Provide removable stops on guides to prevent over-travel of curtain, and continuous bar for holding windlocks.
 6. Weather Seals: Provide vinyl or neoprene weatherstripping for exterior exposed doors except where otherwise noted. At door heads, use 1/8" thick continuous sheet secured to inside of curtain coil hood. At door jambs, use 1/8" thick continuous strip secured to exterior side of jamb guide.
 7. Vision Lites: Flat slats to have vent cutouts 5 inches wide by 7/8 inch high. spaced typically 3 inches apart and covered with clear Lexan polycarbonate.
- C. Counterbalancing Mechanism: Counterbalance doors by means of adjustable steel helical torsion spring, mounted around a steel shaft and mounted in a spring barrel and connected to the door curtain with the required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
1. Counterbalance Barrel: Fabricate spring barrel of hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and limit barrel deflection to not more than 0.03" per ft. of span under full load.
 - a. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.
 - b. Fabricate torsion rod for counterbalance shaft of case-hardened steel, of required size to hold fixed spring ends and carry torsional load.
 - c. Springs shall be rated for 100,000 cycles.
 2. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate with bell mouth guide groove for curtain.
 3. Hood: Form to entirely enclosed coiled curtain and operating mechanism at opening head, and act as weather seal.

- a. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness.
 - b. Provide closed ends for surface-mounted hoods, and any portion of between-jamb mounting projecting beyond wall face.
 - c. Provide intermediate support brackets as required to prevent sag.
 - d. Fabricate steel hoods for doors of not less than 24-gauge hot-dip galvanized steel sheet with G 90 zinc coating, complying with ASTM A 525. Phosphate treat before fabrication.
 - e. Factory finish to match finish on curtain slats.
- D. Painting: For those parts not indicated to receive a factory finish, shop clean and prime non-factory finished ferrous metal surfaces, exposed and unexposed, except faying and lubricated surfaces and galvanized metal, with door manufacturer's standard rust inhibitive primer.
- E. Electric Door Operators: Micanan VFD Variable Frequency Drive Operator. Furnish electric door operator assembly; complete with electric motor and factory-prewired motor controls, gear reduction unit, solenoid operated brake, remote control stations, control devices, conduit and wiring from controls to motor and central stations, and accessories required for proper operation. Door to operate at two feet per second.
- 1. Provide hand-operated disconnect or a mechanism for automatically engaging a sprocket and chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so they are accessible from floor level. Include an interlock device to automatically prevent motor from operating when emergency operator is engaged.
 - 2. Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
 - 3. Door Operator Type: Provide wall mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on counterbalance shaft, and a disconnect-release for manual operation.
 - 4. Provide motor and drive assembly of horsepower and design as determined by door manufacturer for size of door required.
 - 5. Electric Motors: Provide high-starting torque, reversible, variable speed, Class A insulated electric motors with overload protection, sized to move door in either direction, from any position.
 - a. Coordinate wiring requirements and current characteristics of motors with lding electrical system.
 - b. Furnish open-drip-proof type motor and controller with NEMA Type I enclosure.
 - 6. Remote Control Station: Provide recessed momentary-contact, 3-button control station with push button controls labeled "open", "close" and "stop".
 - a. Provide interior units, full-guarded type, recessed-mounted, heavy-duty, with general purpose NEMA Type 1 enclosure.
 - 7. Automatic Reversing Control Bottom Bar: Furnish each door with automatic safety switch, extending full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch before fully closing will immediately stop downward travel and reverse direction to fully opened position. Connect to control circuit through retracting safety cord and reel, or self-coiling cable.
 - 8. Automatic Reversing Control Photo Eye: Door to be equipped with a minimum of one set of transmitter / receiver style photo eyes set at a height determined by the owner. Reflective type photo eyes shall not be allowed.
 - 9. Door Warning Light: Coordinate installation with door warning light as indicated.
 - 10. Wiring: Electrical contractor shall furnish and install conduits and wiring for jobsite power and conduits for all control wiring.
 - 11. Door Operation: Automatic Close: Doors shall time out and close once the exterior photo eye is activated and cleared. Provide Auto/Manual switch. In Auto, the remotes shall

open doors only. In Manual, the remotes shall open, stop and close the doors and the auto close function shall be disabled.

2.02 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Verify completeness of shipment upon receipt of materials. Confirm all delivery of all component parts with original shipping manifest.
 - 2. Delivery of materials shall be in original rolls, packages, boxes or crates bearing the manufacturer's name, brand, model number, and installation location.
- B. Storage and Handling Requirements:
 - 1. Store all materials in dry locations with adequate ventilation, free from dust and water, and available for inspection and handling.
 - 2. Handle doors carefully to prevent damage. Remove damaged items that cannot be restored to the acceptance of the Owner's Representative and Architect and replace with new items.
- C. Packaging Solid Waste Management:
 - 1. Wood Shipping Containers and Crates:
 - a. Verify all door components, parts, signage, labels, manuals and paperwork have been removed, unpacked, and are accounted for from shipping containers prior to processing for recycling or disposal.
 - 2. Minimize waste and divert materials from landfills.

2.03 WARRANTIES

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard form in which manufacturer and installer agree to repair or replace Overhead Coiling Door assemblies, components, and accessories that fail within the materials or workmanship specified periods.
 - 2. Warranty Period: Provide the following:
 - a. Beginning Coverage: The period of warranty shall start from the date of Substantial Completion and shall cover a period as described herein.
 - b. The motor is guaranteed against defects in materials and workmanship for a period of 5 full years (excludes catch system). All other mechanical and electrical components are warranted against defects for a period of 2 full years.
 - c. Door and Vision panels are warranted against defects for a period of 7 full years.
- B. During the warranty period, installation labor is covered for the first year.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports in accordance with final shop drawings, manufacturer's instructions, and as specified herein.
- B. Coordination: Coordinate all work with that of other trades. Ensure that all required backing for mounting systems are in place. Coordinate electrical requirements to verify that necessary wiring and controls are in place. No exposed conduit and/or wiring will be permitted.
- C. Upon completion of installation including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist or distortion and fitting weathertight for entire perimeter.

3.02 ADJUSTING AND CLEANING

- A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the architect as soon as the erection is complete. Any defects noted shall be corrected.
- B. Clean surfaces and repaint abraded or damaged surfaces to match factory-applied finish.

- C. Coordination: Coordinate all work with that of other trades. Ensure that all required backing for mounting systems are in place.
 - 1. Coordinate electrical requirements to verify that necessary wiring and controls are in place. No exposed conduit and/or wiring will be permitted.
- D. Upon completion of installation including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist or distortion and fitting weathertight for entire perimeter.

END OF SECTION

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**SECTION 08 35 13
PANEL FOLDING DOORS**

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes Four-Fold metal doors with surface mounted tube frames.
- B. Operation of Four-Fold metal doors includes overhead mounted electro-mechanical operator(s) located on the interior side of the wall. Doors shall be mounted on the exterior side of wall and fold outward.

1.02 REFERENCE STANDARDS

- A. ASCE 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.
- B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- C. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing; 2025.
- D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 RELATED DOCUMENTS

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

1.04 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 30 00 Administrative Requirements.
- B. Product Data for each type of product specified consisting of manufacturer's technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.
- C. Submittal Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.
- D. Installer reference list including (5) successful installations of this type of door within the past two (2) years.

1.05 QUALITY ASSURANCE

- A. Doors shall be designed to withstand external or internal horizontal wind loads of 120mph (3 second gust) per ASCE 7-16. The maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC "Steel Construction Manual".
- B. Door manufacturer shall have at least 10 years experience in manufacturing door type specified.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling.
- B. Handle materials carefully to prevent damage.

1.07 WARRANTY

- A. The door manufacturer shall provide a written standard limited warranty for material and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer: Door Engineering and Manufacturing, 101 Power Dr, Mankato, MN 56001, (800)-959-1352.
 - 1. Four-Fold industrial metal doors, Model: FF300XT, glazed.
 - 2. No Substitutions allowed.

2.02 MATERIALS

- A. Steel Tube: ASTM A513/A513M and ASTM A500/A500M.
- B. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1008/A1008M cold-rolled steel sheet.
- C. Hardware: Manufacturer's standard components.
- D. Fasteners: Zinc-coated steel.

2.03 FOUR-FOLD DOORS

- A. Construction: Door framing shall be minimum 11-gauge structural steel tube with 14-gauge steel sheet on the exterior and interior faces. Sheet piling shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.
- B. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS 6 x 4 x 3/16", designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.
- C. Factory finish: Door Panels and Tube Frames shall be finished with manufacturer's standard PPG Spectracron epoxy primer and polyurethane top coat. Architect to select from Manufacturer's standard color chart or furnish sample to match.
 - 1. Operator and operating hardware shall be powder-coated manufacturer's standard gray.
- D. Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.
 - 1. All hardware, including hinges and trolleys, shall be bolted to the panel for easy removal for service or panel replacement.
 - 2. Doors up to 16' wide and under 30psf windload shall require no floor mounted supports, guides or tracks.
 - 3. Top tracks shall be adjustable on the end track hangers to allow for adjustment of the door panels in the open position and easily replaceable without removal of the door framing or operators.
 - 4. Track Hood: A full width hood shall be provided to cover the exterior track and trolleys.
- E. Hinges: Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings.
 - 1. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum 3/4" diameter hardened steel.
- F. Weatherstripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16" cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weatherstripping

at sill shall include two 1/16" cloth inserted neoprene sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.

- G. Perimeter Weatherstripping: Provide jamb and head weather-stripping of 1/16" cloth-inserted neoprene bulb (or closed cell neoprene).
- H. Vision Panels: Provide 1" insulated, tempered, vision panels of the size, shape and location as noted on the drawings.

2.04 OPERATOR

- A. Each Four-Fold door shall be operated by overhead mounted electro-mechanical drive units mounted on the interior face of the header. Operator consists of an electric motor, gear reducer, and rotating drive arm which folds the door to the exterior. The door shall be operated with connecting rods attached to the rotating drive arm on the operator. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.
- B. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to manual operation.
- C. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for three phase 208/230/480 VAC, 60 Hertz operation.
- D. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards.
 - 1. Incoming electrical shall be either:
 - a. 120VAC single phase
 - b. 208VAC single phase
 - c. 208/230VAC 3-phase
 - d. 480VAC 3-phase.
 - 2. Coordinate requirements with Electrical Engineer.
 - 3. Control panel assemblies shall be UL listed as per NFPA 70.
 - 4. Controls shall include a programmable logic controller with digital message display or LED indicators. Controller shall include programmable close timers and programmable inputs/outputs.
 - 5. Controls shall include a variable frequency drive(s) with independent adjustment of the opening and closing speeds.
 - 6. Enclosures shall be NEMA 4 with disconnect switch.
 - 7. Pushbuttons (interior) for each door shall have one (1) momentary pressure three-button push-button station marked "OPEN", "CLOSE" and "STOP". Push button enclosure shall be NEMA 4.
 - 8. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.
 - 9. Safety edges: Provide monitored electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.
 - 10. Photo eyes: Provide (1) interior, jamb mounted, light Curtain type photo eyes, NEMA 4 rated. Photo eye shall cover from floor level to 72" above floor.
 - 11. Presence Sensor: Provide (1) interior, overhead mounted, presence sensor BEA IS40P or equal. Doors over 16' tall shall include LZR-Widescan or equal.
 - 12. Radio controls: Provide one (1) radio receiver and (1) single button remotes per door. Remotes to open and close doors with single button.
 - 13. Timer Activation Loop Detectors for fire stations: Provide "pulse on exit type" loop detector to activate auto close timer once loop has been activated and cleared, include

hand/auto switch to deactivate timer. G.C. to coordinate installation of preformed loop with installer prior to exterior apron being poured.

14. Warning Horn/Strobe: Provide warning light and strobe. Include outputs PLC to allow for activation while door is in motion both opening and closing, along with activation prior to closing. Include programmable "delay-to-close" timer which activates the warning horn for a set time, prior to the door closing.
15. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.
- B. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

3.02 ADJUSTING AND CLEANING

- A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.
- B. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

END OF SECTION

SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Aluminum-Framed Storefront System.
- B. Aluminum-Framed Entrances.

1.03 RELATED SECTIONS

- A. Section 07 92 00 - Joint Sealants
- B. Section 08 71 00 - Door Hardware
- C. Section 08 80 00 - Glazing

1.04 REFERENCES

- A. AAMA 501.1 – Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure.
- B. AAMA 1503 – Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- C. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- D. ASTM A164 – Standard Specifications for Electrodeposited Coatings of Zinc on Steel.
- E. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- G. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- H. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 – Administrative Requirements
- B. Product Data: Manufacturer's data sheets and detail drawings for each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation details and methods.
- C. Quality Assurance/Control Submittals:
 - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.
- D. Samples: Submit samples of specific finish material and color as indicated on Finish Schedule.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.

- B. Provide test reports from AAMA accredited laboratories certifying the performances as specified in paragraph 1.05.C.1.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.
- B. Store products indoors in manufacturers or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.

1.08 PROJECT CONDITIONS

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

1.09 WARRANTY

- A. System shall be warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years.

PART 2 – PRODUCTS

2.01 ALUMINUM-FRAMED EXTERIOR STOREFRONT SYSTEM

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide aluminum-framed storefront systems as manufactured by Arcadia, Inc., or equal.
 - 1. Model: TC-470 Series.
- B. Materials: 2 inch x 4-1/2 inch offset glazed system, 2 sided and 4 sided structural silicone, screw spline, shear block, compensating stick or punched opening fabrication for 1 IGU or approved equal.
- C. Performance Requirements:
 - 1. Limit air leakage through assembly to 0.06 CFM/min/sq. ft. of wall area at 6.24 PSF as measured in accordance with ASTM E283.
 - 2. Water Resistance: No water leakage when measured in accordance with ASTM E331 with a static test pressure of 8.0 PSF.
 - 3. Dynamic Water Resistance: No water leakage, when measured in accordance with AAMA 501.1-94 with a dynamic test pressure of 12.0 PSF.
 - 4. Limit mullion windload deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E330.
 - 5. System shall not deflect more than 1/8" at the center point, or 1/16" at the center point of a horizontal member, once deadload points have been established.
 - 6. System shall accommodate expansion and contraction movement due to surface temperature differential of 180 degrees Fahrenheit.
 - 7. Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
 - 8. Thermal performance – When tested in accordance with AAMA 1503, the following results should be attained: U. maximum .63/CRF – minimum of 59.
 - 9. National Fenestration Rating Council (NFRC) specific application evaluation.

2.02 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with:
 - 1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication, and installation of component parts.
- B. Design Requirements: Aluminum framing system suitable for outside or inside glazing. Glass shall be centered in frame, with optional structural silicone support at verticals and horizontals. Provides for two-color capability.

2.03 FRAMING MATERIALS AND ACCESSORIES

- A. Framing members, transition members, mullions, adaptors, and mounting: Extruded 6063-T6 aluminum alloy ((ASTM B221)) – Alloy G.S. 10a T6).
- B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc-plated steel in accordance with ASTM A164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from aluminum.
- C. Glazing Gasket (Silicone Compatible).
 - 1. Compression-type design, replaceable, molded, or extruded santoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
 - 2. Shall be of type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.
- D. Glazing: Refer to Section 08 80 00 - Glazing

2.04 FINISH

- A. Finish all exposed areas of aluminum and components as indicated.
 - 1. Finish: Fluorocarbon Coating: AAMA 2605.2.
 - a. Resin: 70% PVDF Kynar 500/Hylar 5000.
 - b. Substrate: cleaned and pretreated with chromium phosphate.
 - c. Primer: Manufacturer's standard resin base compatible coating. Dry film thickness.
 - d. Extrusion: Minimum 0.20 mil.
 - e. Color Coat: 70% PVDF, dry film thickness.
 - f. Extrusion: 1.0 mil.
 - g. Color: As indicated in drawings.
 - 2. Acceptable Coatings Manufacturers:
 - a. PPG Industries, Inc.
 - b. Valspar Corporation.
 - c. BASF.

2.05 SYSTEM FABRICATION

- A. Diverters shall be provided to collect water infiltration and divert from the interior of the system.
- B. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements, for hardware attachment, and as indicated.
- C. Fasteners shall be so located as to ensure concealment from view in the final assembly.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine conditions and verify substrate conditions are acceptable for product installation.

3.02 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturers installation instructions.
- B. General: Install storefront systems plumb, level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions. Provide support and anchor in place.
 - 1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
 - 2. Glazing: Glass shall be held in place with extruded EPDM glazing gaskets on both sides of the glass.

3.03 PROTECTION AND CLEANING

- A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

1. Protect installed products until completion of project.
 2. Touch-up, repair or replace damaged products before Substantial Completion.
- B. Cleaning: Repair or replace damaged installed products. Installed products are to be cleaned in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

**SECTION 08 51 13
ALUMINUM WINDOWS**

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure; 2017.
- B. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- F. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- G. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference; 2000 (Reapproved 2024).

1.02 RELATED DOCUMENTS

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

1.03 SECTION INCLUDES

- A. Aluminum Framed Windows

1.04 RELATED SECTIONS

- A. Section 07 25 00 - Weather Barriers
- B. Section 07 65 26 - Self Adhering Flashing Tape
- C. Section 07 92 00 – Joint Sealants
- D. Section 08 80 00 - Glazing

1.05 REFERENCES

- A. AAMA 501.1-94 – Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure.
- B. AAMA 1503 – Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- C. AAMA 2605.2 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- D. ASTM A164 – Standard Specifications for Electrodeposited Coatings of Zinc on Steel.
- E. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- G. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- H. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.06 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 "Administrative Requirements".
- B. Product Data: Manufacturer's data sheets and detail drawings for each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation details and methods.
- C. Quality Assurance/Control Submittals:
 - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.
- D. Samples: Submit samples of specific finish material and color as indicated on Finish Schedule.

1.07 QUALITY ASSURANCE

- A. Design criteria: Drawings indicate sizes, profiles, and dimensional requirements of thermally improved composite windows. Window units having minor deviations from dimensions and profiles indicated on drawings may be accepted, provided such deviations do not materially detract from design concept or intended performances and subject to approval of the Architect.
- B. Standards: Except as otherwise indicated, requirements for thermally improved composite windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in AAMA/NWWDA 101/93 (American Architectural Manufacturer's Association) applicable general recommendations published by AAMA and AA.
- C. Performance and Testing:
 - 1. Except as otherwise indicated, comply with air infiltration tests, water resistance tests, uniform load deflection tests, and uniform load structural tests specified in ANSI/AAMA 302.9 for type and classification of window units required in each case.
 - a. Testing standards for air infiltration, water penetration and structural performance: AAMA/NWWDA 101/I.S.2 - 97 for type of window configuration indicated.
 - b. Air infiltration: Maximum 0.32 CFM per foot of overall sash crack at inward test pressure of 1.57, ASTM E 283.
 - c. Water penetration: No water penetration at inward test pressure of 3.0 psf, ASTM E547.
 - d. Structural performance: No glass breakage, damage to hardware, permanent deformation at positive and negative test pressure of 30.0 psf, ASTM E 330 - 90.
 - 2. Testing: Where manufacturer's standard window units comply with requirements and have been tested in accordance with specified tests, provide certification by manufacturer showing compliance with such tests; otherwise, perform required tests through a recognized testing laboratory or agency and provide certified test result.

1.08 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, recommendations, and standard details for thermally improved composite windows units, including certified test laboratory reports as necessary to show compliance with requirements.
- B. Submit complete materials list of all items proposed to be furnished and installed under this Section.
- C. Submit Shop Drawings including wall elevations at 1/4 inch scale, typical unit elevations at 3/4 inch scale, and full size detail sections of every typical composite member and wall construction type. Show anchors, hardware, screens and other components not included in manufacturer's standard data. Include glazing details.
- D. Provide certification that units comply with the requirements and have been tested in accordance with specified tests.
- E. Samples: Submit samples of composite frame with required interior and exterior finish applied.

1.09 PRODUCT HANDLING

- A. Comply with provisions of Section 01 60 00.

1.10 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing thermally improved composite windows and a minimum five years documented experience.

1.11 WARRANTY

- A. Provide manufacturer's standard warranty which agrees to repair or replace units that fail in workmanship for a period of ten years from the original date purchase. Warranty includes coverage of materials and labor in full by the manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fixed (picture) and Casement Windows:
 - 1. International Windows, Ambassador 8200 Series Thermally Broken Aluminum Windows or approved equal. Windows shall be dual glazed of the types indicated (with nailing fin).
 - a. Windows shall be either fixed (picture) or casement as indicated in the Window Schedule and Exterior Elevations.
 - b. Color/Finish: As Indicated on drawings.

2.02 FABRICATION

- A. Fabricate windows to AAMA/WDMA - 101/I.S.2.
- B. Fabricate framing, mullions and sash members with mechanically joined, mitered, sealed corners and joints. Supplement frame sections at corners with structural hidden corner keys.
- C. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- D. Separate interior and exterior aluminum components with integral low conductance thermal barrier.
 - 1. Accurately fit and secure joints and intersections. Make joints flush, hairline, and weathertight.
 - 2. Fabricate in largest practical units.
 - 3. Weatherstrip operable sash.
 - 4. Reinforce corners and intersections.
- E. Provide internal offset weepholes & channels to migrate moisture outside. Weepholes should be covered by weep gates.
- F. Prepare components to receive anchor devices.
- G. Provide integral weather stop flange to perimeter of unit.
- H. Provide soft vinyl T-bulb or polypropylene fin seal weather-stripping.
- I. Assemble insect screens to fully integrate with window frame. Frames to be manufactured of cambered aluminum and reinforced with rigid plastic corner keys. Screen mesh to fit taut in frame and secured. Locate screens on inside or outside of window sash or ventilator, depending on window type. Design windows and hardware to accommodate screens in a tight-fitting removable arrangement with a minimum of exposed fasteners and latches.

2.03 FINISHES

- 1. Aluminum: AAMA 611, Architectural Class III – color per Drawings: Finish Schedule.
- 2. Screens:
- 3. Mesh: Charcoal
- 4. Frame: Color to match windows

2.04 GLAZING

- A. Glazing: Factory exterior glazed except where field glazing is required due to large window unit dimensions. Units shall be re-glazeable without dismantling sash framing.
 - 1. Provide aluminum glazing bead to match exterior window finish.
 - 2. Glazing area in vent to be equally proportional to glazing area in fixed unit resulting in equal sight lines.
 - 3. Provide Insulated Glazing Units (IGUs) at energy efficiency required by code and per Title 24 calculation.

2.05 HARDWARE

- A. Hardware: Provide the manufacturer's standard hardware fabricated from a corrosive resistant material and of sufficient strength to perform its intended function. For application of exposed hardware, use fasteners that match the finish of the hardware being fastened.

2.06 OTHER MATERIALS

- 1. All other materials, not specifically described but required for a complete and proper installation, including but not limited to pole operators, shall be new, first quality of their respective kinds, and subject to approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection: Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

3.02 INSTALLATION

- A. Install all windows with adequate provision for settling, expanding, and contracting to occur without breaking glass. Windows shall be factory sized to fit in each framed opening so that the net sized window is 1/2" smaller than the framed (rough) opening to allow 1/4" clearance on all sides (tolerance +/- 1/16") and with weep holes at bottom in a weathertight manner.
- B. Opening panels must be closed and locked during installation. Windows must be installed level, plumb and square with 1/4" clearance on all sides and with weep holes at bottom in a weathertight manner.
- C. Headers must not be nailed. Nail through nailing fin into framing along sides and base. At the head, finishing nails may be placed 1/2" above the frame and bent down over frame to allow for header deflection. Full support is required along entire length of sill.
- D. Protection:
 - 1. Protect all finished surfaces as necessary to prevent damage during progress of the Work.

3.03 CLEANING

- A. Immediately prior to acceptance of the Work, remove all protective materials from the windows and clean all exposed members.
- B. Wash down surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Do not use petroleum distillates.
- D. Abrasives: Do not use abrasives or harmful cleaning agents.

3.04 ADJUSTING

- A. Adjust windows for smooth operation.
- B. Touch up minor scratches and abrasions to match original finish.

END OF SECTION

SECTION 08 51 23

FIRE-RATED STEEL WINDOWS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fire-rated custom steel windows.
- B. Accessories including hardware, mullion covers, installation straps, fasteners, and sealants.

1.2 RELATED SPECIFICATION SECTIONS

- A. 01 30 00 Administrative Requirements
- B. 01 60 00 Product Requirements
- C. 07 25 00 Weather Barriers
- D. 07 62 00 Sheet Metal Flashing and Trim
- E. 07 65 26 Self-Adhering Sheet Flashing
- F. 07 92 00 Joint Sealants
- G. 08 51 13 Aluminum Windows
- H. 08 80 00 Glazing

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA 502: Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
- B. ASTM International
 - 1. ASTM A36: Standard Specification for Carbon Structural Steel.
 - 2. ASTM A240: Standard Specifications for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 3. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 4. ASTM A666: Standard Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
 - 5. ASTM C864: Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - 6. ASTM C920: Standard Specification for Elastomeric Joint Sealants.
 - 7. ASTM C1281: Standard Specification for Preformed Tape Sealants for Glazing Applications.
 - 8. ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

9. ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, Curtain Walls by Uniform Static Air pressure Difference
 10. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- C. American Welding Society (AWS)
1. ANSI/AWS C2.23: Specification for the Application of Thermal Spray Coatings (Metalizing of Aluminum, Zinc, and their Alloys and Composites for the Corrosion Protection of Steel.
- D. Consumer Product Safety Commission (CPSC): CPSC 16 CFR 1201 – Safety Standard for Architectural Glazing Materials.
- E. Glass Association of North America (GANA) – GANA – Glazing Manual.
- F. International Building Code (IBC)
- G. National Fire Protection Association (NFPA)
1. NFPA 80: Fire Doors and Windows.
 2. NFPA 257: Fire Test for Window and Glass Block Assemblies.
- H. The Society for Protective Coatings (SSPC)/NACE International
1. SSPC-SP 10/NACE No. 2: Joint Surface Preparation Standard for Near White Blast Cleaning.
- I. Steel Window Institute (SWI)
- J. Underwriters Laboratories (UL)
- K. Leadership in Energy and Environmental Design (LEED)
- 1.4 ADMINISTRATIVE REQUIREMENTS
- A. Pre-installation meeting: Conduct a pre-installation meeting at the job site attended by Owner, Architect, manufacturer's technical representative, window installer, and contractors of related trades. Coordinate structural support requirements in relation to window installation, installation of air/water barriers, treatment of fenestration, and other requirements specific to the project.
- 1.5 SUBMITTALS
- A. Product Data: Submit manufacturer's current technical literature for each type of product.
- B. Shop Drawings; Submit detailed drawings showing:
1. Window profiles.

2. Location, layout and dimensions of windows.
3. Location and type of fasteners.
4. Shape and method of attachment of all trim
5. Locations and type of sealants
6. Other details as may be required for a weather tight installation

C. Samples:

1. Provide nominal 3 by 5 inch color sample.
 - a. Color to match adjacent aluminum windows.
2. Provide sample of each hardware component.

D. Quality Assurance Submittals

1. Design Data, Test Reports: Provide manufacturer's test report(s) indicating product compliance with requirements.
2. Manufacturer Erection Instructions: Provide manufacturer's written installation instructions including proper material storage, and maintenance instructions.
3. Submit copy of paint system warranty showing compliance with performance criteria.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacturer shall have a minimum of five (5) years experience in the production of custom fire rated steel windows and must be a member of The Steel Window Institute (SWI).

B. Installer Qualifications:

1. Installer shall have a minimum of five (5) years experience in the installation and glazing of similar type of custom cold rolled steel windows. Conform to applicable codes and regulations of authority having jurisdiction for design and installation of fire rated windows.

C. Glazing:

1. Comply with CPSC 16 CFR 1201 and other applicable safety requirements. Each piece of safety glazing shall be permanently labeled with appropriate marking.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 01 60 00 Product Requirements.
- B. Deliver materials and components in manufacturer's original, unopened, undamaged packaging with identification labels intact.

- C. Store materials on dry, level, firm, and clean surface. Elevate windows and cover to allow air to circulate and moisture to escape.

1.8 WARRANTY

- A. Refer to Section 01 78 36 - Warranties.
- B. Warranty: Standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.
- C. Finish Warranty: Standard form in which manufacturer agrees to repair or replace factory finish that fails due to fading, gloss retention or chalking within specified warranty period.
 - 1. Warranty Period: Ten (10) years from date of delivery from Factory.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Optimum Window; 28 Canal Street, Ellenville, New York 12428; 1-845-647-1900 (www.optimumwindow.com)
 - 1. Windows: To match profile and color of adjacent aluminum windows as closely as possible.
- B. Substitution Limitations:
 - 1. Submit written request for approval of substitutions to the Architect a minimum of [14] days prior to the date for receipt of bids. Include the following information:
 - a. Name of the materials and description of the proposed substitute.
 - b. Drawings, cut sheets, performance and test data.
 - c. List of projects of similar scope.
 - d. Test reports indicating compliance with the performance criteria.
 - e. Other information necessary for evaluation.
 - 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 – General Requirements.

2.2 PERFORMANCE CRITERIA

- A. Structural Performance:

1. Wind Loads: In accordance with ASTM E330.
 - a. Deflection criteria shall be min. $L/175$, or as required by local Jurisdiction.

B. Design Criteria:

1. Fire Rating: Testing shall be done in accordance with NFPA 80 and 257.
 - a. Windows: Refer to window schedule on Drawings.
2. Air Infiltration: Maximum air infiltration allowed is 0.37 cubic feet per minute per linear foot of crack length with a pressure differential across the window of 6.24 pounds per square foot, in accordance with ASTM E283.
3. Water Penetration: No water penetration for 15 minutes allowed when windows are subjected to a rate of flow of 5 gallons per hour per square feet with a pressure differential of 2.86 pounds per square foot, in accordance with ASTM E331.

2.3 MATERIALS

- A. Steel sections shall meet the requirements of ASTM A36.
- B. Anchors, clips, and accessories: Stainless steel complying with ASTM A666 or hot-dip zinc-coated steel complying with ASTM A653.
- C. Weather-stripping: Manufacturer's standard EPDM gaskets.
- D. Glazing Stops: Manufacturer's standard steel section.

2.4 WINDOWS

A. Casement Window (FR4700):

1. Window Fabrication:
 - a. Frame and Ventilator:
 - 1) Frame and Ventilator: 2-1/8 inch deep, minimum with 5/8 inch glazing rebate.
 - 2) Frame corners shall be mitered, welded, and finished smooth and flush with adjacent surfaces.
 - b. Steel sections shall be shot-blasted after fabrication per SSPC-SP 10/NACE No. 2 prior to application of factory finish.
 - c. Fabrication Tolerances: $\pm 1/16$ inch.
 - d. Glazing beads: Mechanical fastened glazing beads applied to window interior.

- e. Weather-stripping: Manufacturer's standard removable.
- f. Casement Window Hardware:
 - 1) Operator: Manual push with concealed friction limit.
 - 2) Hinges: Steel, self-closing type.
 - 3) Locking Device: Cam handle with keeper.

2.5 GLAZING

- A. Factory Glaze window units.
 - 1. Type: Fire rated laminated glass with intumescent interlayer, listed by UL for designated fire rated assembly.
 - a. Glazing Unit insulated glass unit, per the Schedule in the Drawings.
 - b. Low-E Coated Glass
 - c. Color: Clear
- B. Gaskets: Molded or extruded elastomeric type of profile and hardness required to maintain weather tight seal and complying with ASTM C864.
- C. Setting blocks: Neoprene or EPDM complying with ASTM C864.
- D. Glazing Tape: Preformed, non-staining, coiled on release paper, and complying with ASTM C1281.
- E. Glazing Sealants: As recommended by window manufacturer and is compatible with materials and conditions.

2.6 ACCESSORIES

- A. Insect screens: Provide screens at all operable windows
 - 1. Screen: aluminum mesh.
- B. Trim: Provide mullion covers, attachment clips, and other trim required for complete, finished installation as detailed on Drawings and approved shop drawings.
- C. Sealants: Refer to Section 07 92 00 – Joint Sealants
- D. Anchorage Devices: Manufacturer's recommended clips, anchors, fasteners, and shims required for secure installation of window units.

2.7 FINISHES

- A. Galvanize steel components prior to application of primer and finish coats.

- B. Primer: Apply one coat zinc rich epoxy primer; 3 mils dry film thickness.
- C. Finish Coat:
 - 1. Electrostatically applied, colored, polyester powder coating. Baked at 350 to 395 degrees F. until chemically bonded to metal substrate.
 - 2. Finish coat thickness: Minimum 3 to 6 mils dry film thickness.
 - 3. Overall finish thickness: 6 to 9 mils dry film thickness.
 - 4. Color: Custom color as selected by Architect to match color of adjacent aluminum windows.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Provide field measurements as required to achieve proper fit of windows.
- B. Verify that openings are ready to windows.
- C. Where contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

3.2 INSTALLATION

- A. General:
 - 1. Install in accordance with NFPA 80 and approved shop drawings.
 - 2. Comply with manufacturer's written instructions.
 - 3. Do not install damaged components. Refinish or replace damaged components as directed by Architect.
 - 4. Seal joints watertight unless otherwise indicated.
 - 5. Units shall be installed plumb, level and free of warp or twist.
- B. Adjust hardware, and accessories for a tight fit, smooth operation and weather tight closure.
- C. Clean factory-finished steel surfaces immediately after installing. Comply with manufacturer's written recommendations for final cleaning and maintenance. Avoid damaging finishes.
- D. Attach insect screens on windows indicated, install screens level and plumb.

3.3 FIELD QUALITY CONTROL

- A. Field Testing: After completing partial installation of window assembly, including accessories and trim, test for air and water penetration in accordance with AAMA 502, Test Method A.

END OF SECTION

**SECTION 08 71 00
DOOR HARDWARE**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2024.
- B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- C. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- D. BHMA A156.1 - Standard for Butts and Hinges; 2025.
- E. BHMA A156.3 - Exit Devices; 2020.
- F. BHMA A156.4 - Door Closers and Pivots; 2024.
- G. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.
- H. BHMA A156.13 - Mortise Locks and Latches; 2022.
- I. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2023.
- J. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2024.
- K. ISO 9000 - Quality Management Systems -- Fundamentals and Vocabulary; 2015.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- N. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.
- O. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- P. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- Q. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- R. UL 305 - Standard for Panic Hardware; Current Edition, Including All Revisions.
- S. UL 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives; Current Edition, Including All Revisions.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

- A. Section includes:
 - 1. Mechanical and electrified door hardware for:
 - a. Swinging doors.
 - b. Gates.
 - c. Roll-up Doors.
- B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:
 - 1. Windows
 - 2. Cabinets (casework), including locks in cabinets.
 - 3. Signage
 - 4. Toilet accessories
 - 5. Overhead doors
 - 6. Installation.
 - 7. Rough hardware.

8. Conduit, junction boxes & wiring.
9. Folding partitions, except cylinders where detailed.
10. Sliding aluminum doors, except cylinders where detailed.
11. Access doors and panels, except cylinders where detailed.

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
3. Division 09 sections for touchup finishing or refinishing of existing openings modified by this section.
4. Division 26 sections for connections to electrical power system and for low-voltage wiring.
5. Division 28 sections for coordination with other components of electronic access control system.

1.04 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

C. California Code of Regulations

1. Title 24: California Building Standards Code

1.05 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.

B. Action Submittals:

1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
 - a. Door Index; include door number, heading number, and Architects hardware set number.

- b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
 - c. Type, style, function, size, and finish of each hardware item.
 - d. Name and manufacturer of each item.
 - e. Fastenings and other pertinent information.
 - f. Location of each hardware set cross-referenced to indications on Drawings.
 - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - h. Mounting locations for hardware.
 - i. Door and frame sizes and materials.
 - j. Name and phone number for local manufacturer's representative for each product.
 - k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
 - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
5. Key Schedule:
- a. Initiate and conduct meeting(s) with Owner representatives and hardware supplier to determine system keyway(s), keybow styles, structure, stamping, degree of physical security and degree of geographic exclusivity. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner.
 - b. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used, and door numbers controlled.
 - c. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - d. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - e. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - f. Provide one complete biting list of key cuts and one key system schematic illustrating system usage and expansion.
 - 1) Forward biting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.
- C. Informational Submittals:
- 1. Qualification Data: For Supplier and Installer.
 - 2. Product Certificates for electrified door hardware, signed by manufacturer:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - 3. Certificates of Compliance:
 - a. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
 - 4. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Final approved hardware schedule, edited to reflect conditions as installed.
 - e. Final keying schedule
 - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 - g. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.06 QUALITY ASSURANCE

- A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.
 1. Where specific manufacturer's product is named and accompanied by "Owner Standard," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
 - a. Where no additional products or manufacturers are listed in product category, requirements for "Owner Standard" govern product selection.
 2. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.
- B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project.
 1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 2. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 3. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.
- D. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
 2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- E. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

- F. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
- G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- H. Means of Egress Doors: Latches do not require more than 5 lbs (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
- I. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbs (22.2 N).
 - 2. Maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbs (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbs (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: The minimum opening force allowable by the appropriate administrative authority, not to exceed 15 lbs (66.7N).
 - 3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 - 4. Adjust closer so that the time required to move the door from the 90-degree position to 12 degrees from the latch is 5 seconds minimum.
- J. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Inspect and discuss preparatory work performed by other trades.
 - 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 - 4. Review sequence of operation for each type of electrified door hardware.
 - 5. Review required testing, inspecting, and certifying procedures.
- K. Coordination Conferences:
 - 1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
 - a. Attendees: Door hardware supplier, door hardware installer, Contractor.
 - b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.
 - 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.
 - a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Owner's security consultant, Architect and Contractor.
 - b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer's original packaging.
 - C. Project Conditions:
 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
 2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
 - D. Protection and Damage:
 1. Promptly replace products damaged during shipping.
 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
 - E. Deliver keys and permanent cores to Owner by registered mail or overnight package service.
- 1.08 COORDINATION
- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
 - B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
 - C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
 - D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
 - E. Existing Openings:
 1. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
 2. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.
 - F. Direct shipments not permitted, unless approved by Contractor.

1.09 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
 - a. Closers:
 - 1) Mechanical: 30 years.
 - b. Exit Devices:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - c. Locksets:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - d. Key Blanks: Lifetime
 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.10 MAINTENANCE

- A. Maintenance Tools:
 - 1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Where "Owner Standard" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturer" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

- A. Fasteners
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 - 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
 - 4. Install hardware with fasteners provided by hardware manufacturer.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:
 - 1. Data: 24AWG, 4 conductors shielded, Belden 9843, 9841 or comparable.
 - 2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.
 - 3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.
 - 4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with sufficient number and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

- A. Manufacturers and Products:
 - 1. Scheduled Manufacturer and Product: Ives 5BB series
 - a. Acceptable Manufacturers and Products: Hager BB series, Best FBB series, Stanley FBB Series.
- B. Requirements:
 - 1. Provide five-knuckle ball bearing hinges conforming to ANSI/BHMA A156.1.
 - 2. 1-3/4 inch thick doors, up to and including 36 inches wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches high
 - b. Interior: Standard weight, steel, 4-1/2 inches high
 - 3. 1-3/4 inch thick doors over 36 inches wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches high
 - b. Interior: Heavy weight, steel, 5 inches high
 - 4. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches high
 - b. Interior: Heavy weight, steel, 5 inches high
 - 5. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
 - 6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
 - 7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
 - 8. Width of hinges: 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
 - 9. Doors 36 inches wide or less furnish hinges 4-1/2 inches high; doors greater than 36 inches wide furnish hinges 5 inches high, heavy weight or standard weight as specified.
 - 10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
 - 11. Provide mortar guard for each electrified hinge specified.
 - 12. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches or less in height. Provide one additional bearing hinge for each 30 inches of additional door height.

2.04 PIVOT SETS

- A. Manufacturers:
 - 1. Scheduled Manufacturer: Ives
 - 2. Acceptable Manufacturers: Dorma, Rixson
- B. Requirements:
 - 1. Provide pivot sets complete with oil-impregnated top pivot, unless indicated otherwise.
 - 2. Where offset pivots are specified, Provide one intermediate pivot for doors less than 91 inches high and one additional intermediate pivot per leaf for each additional 30 inches in height or fraction thereof. Intermediate pivots spaced equally not less than 25 inches or not more than 35 inches on center, for doors over 121 inches high.
 - 3. Provide appropriate model where pivot sets are scheduled at fire rated openings.
 - 4. Provide lead-lined model where pivot sets are specified at lead-lined doors.
 - 5. Provide pivots with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.

Locate electrified pivot nearest to electrified locking component. If manufacturer of electrified locking component requires another device for power transfer, then provide recommended power transfer device and appropriate quantity of pivots.

6. Provide mortar guard for each electric pivot specified, unless specified in hollow metal frame specification.

2.05 ELECTRIC POWER TRANSFER

- A. Manufacturers:
 - a. Scheduled Manufacturer: Von Duprin EPT-10
 - b. Acceptable Manufacturers: ABH PT1000, Securitron CEPT-10
- B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
- C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 MORTISE LOCKS

- A. Manufacturers and Products:
 1. Scheduled Manufacturer and Product: Schlage L9000 series
 2. Acceptable Manufacturers and Products: Best 45H series, Sargent 8200 series
- B. Requirements:
 1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
 2. Provide locks with standard 2-3/4 inches backset with full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch throw, constructed of stainless steel.
 3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 4. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
 - a. UL Listed – 1-hour fire door.
 5. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Lever Design: As scheduled.

2.07 ALUMINUM DOOR LOCKS

- A. Manufacturer and Product:
 1. Scheduled Manufacturer and Product: Adams Rite MS1850 series
 2. Acceptable Manufacturers and Products: Owner Standard.
- B. Requirements:
 1. Provide narrow style aluminum door locks as specified. Cylinders: Refer to "KEYING" article, herein.
 2. Provide locks with backset as required for door detail with full 5/8 inch throw latchbolt.
 3. Provide manufacturer's standard strikes unless extended lip strikes are necessary to protect trim.

2.08 EXIT DEVICES

- A. Manufacturers and Products:
 1. Scheduled Manufacturer and Product: Von Duprin 98 series
 2. Acceptable Manufacturers and Products: Sargent 8000 series, Precision Apex series.
- B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Touchpad: Extend minimum of one half of door width. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. No plastic inserts are allowed in touchpads.
4. Provide exit devices with dead-latching feature for security and for future addition of alarm kits and/or other electrified requirements.
5. Provide flush end caps for exit devices.
6. Provide exit devices with manufacturer's approved strikes.
7. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
8. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
9. Provide cylinder dogging at non-fire-rated exit devices.
10. Removable Mullions: 2 inches x 3 inches steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
11. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
 - a. Lever Style: Match lever style of locksets.
12. Accessibility: Maximum 5lbs force to retract latch bolt per CBC Chapter 11B.
 - a. "AX" feature: touchpad directly retracts the latchbolt with 5 lbs. or less of force. Provide testing lab certification confirming that the mechanical device is independent third-party tested to meet this 5 lb. requirement.
13. Provide UL labeled fire exit hardware for fire rated openings.
14. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
15. Provide electrified options as scheduled.

2.09 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Schlage
2. Acceptable Manufacturers: Medeco, Best.

B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Temporary Construction Cylinder Keying. full-sized non-IC core.
3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent-protected: Schlage Everest D, Restricted, as per owner confirmation.
4. Nickel silver bottom pins.
5. Temporary Construction Cylinder Keying.
 - a. Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
 - 1) Split Key or Lost Ball Construction Keying System.
 - 2) 3 construction control keys, and extractor tools or keys as required to void construction keying.
 - 3) 12 construction change (day) keys.
 - b. Owner or Owner's Representative will void operation of temporary construction keys.

6. Replaceable Construction Cores:
 - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - 1) 3 construction control keys
 - 2) 12 construction change (day) keys.
 - b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.10 KEYING

- A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Provide cylinders/cores keyed into Owner's existing factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- C. Requirements:
 1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - a. Master Keying system as directed by the Owner.
 2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.
 3. Provide keys with the following features:
 - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - b. Patent Protection: Keys and blanks protected by one or more utility patent(s)
 4. Identification:
 - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.
 - b. Identification stamping provisions must be approved by the Architect and Owner.
 - c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - d. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.
 - e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
 5. Quantity: Furnish in the following quantities.
 - a. Change (Day) Keys: 3 per cylinder/core.
 - b. FSIC: Permanent Control Keys: 3.
 - c. Master Keys: 6.

2.11 DOOR CLOSERS

- A. Manufacturers and Products:
 1. Scheduled Manufacturer and Product: LCN 4040XP series.
 2. Acceptable Manufacturers and Products: Sargent 281 series., Falcon 71 Series.
- B. Requirements:
 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certifies closers. Stamp units with date of manufacture code.
 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.

3. Cylinder Body: 1-1/2-inch 1.5 inch diameter piston with 5/8-inch (0.63 inch) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL 10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees Fahrenheit to -30 degrees Fahrenheit.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117 or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.12 DOOR TRIM

- A. Manufacturers:
 1. Scheduled Manufacturer: Ives
 2. Acceptable Manufacturers: Trimco, Hager.
- B. Requirements:
 1. Provide push plates 4 inches wide by 16 inches high by 0.050 inch thick and beveled 4 edges. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
 2. Provide push bars of solid bar stock, diameter, and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back-to-back with pull.
 3. Provide offset pulls of solid bar stock, diameter, and length as scheduled. Where required, mount back-to-back with push bar.
 4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
 5. Provide pulls of solid bar stock, diameter, and length as scheduled. Where required, mount back-to-back with push bar.
 6. Provide pull plates 4 inches wide by 16 inches high by 0.050 inch thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
 7. Provide wire pulls of solid bar stock, diameter, and length as scheduled.
 8. Provide decorative pulls as scheduled. Where required, mount back-to-back with pull.

2.13 PROTECTION PLATES

- A. Manufacturers:
 1. Scheduled Manufacturer: Ives
 2. Acceptable Manufacturers: Hager, Trimco, NGP.
- B. Requirements:
 1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
 2. Sizes of plates:
 - a. Kick Plates: 10 inches high by 2 inches less width of door on single doors, 1 inch less width of door on pairs.

- b. Mop Plates: 4 inches high by 2 inches less width of door on single doors, 1 inch less width of door on pairs.
- c. Armor Plates: 36 inches high by 2 inches less width of door on single doors, 1 inch less width of door on pairs

2.14 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

- A. Manufacturers:
 - 1. Scheduled Manufacturers: Glynn-Johnson
 - 2. Acceptable Manufacturers: Rixson, Sargent
- B. Requirements:
 - 1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
 - 2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
 - 3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
 - 4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.15 DOOR STOPS AND HOLDERS

- A. Manufacturers:
 - 1. Scheduled Manufacturer: Ives
 - 2. Acceptable Manufacturers: Rockwood, Trimco, Hager
- B. Provide door stops at each door leaf:
 - 1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
 - 2. Where a wall stop cannot be used, provide universal floor stops for low- or high-rise options.
 - 3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.16 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

- A. Manufacturers:
 - 1. Scheduled Manufacturer: Zero International
 - 2. Acceptable Manufacturers: National Guard, Pemko
- B. Requirements:
 - 1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
 - 2. Size of thresholds:
 - a. Saddle Thresholds: 1/2 inch high by jamb width by door width
 - b. Bumper Seal Thresholds: 1/2 inch high by 5 inches wide by door width
 - 3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.17 SILENCERS

- A. Manufacturers:
 - 1. Scheduled Manufacturer: Ives
 - 2. Acceptable Manufacturers: Rockwood, Trimco
- B. Requirements:
 - 1. Provide "push-in" type silencers for hollow metal or wood frames.

2. Provide one silencer per 30 inches of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.18 FINISHES

- A. FINISH: BHMA 626/652 (US26D); EXCEPT:
 1. Hinges at Exterior Doors: BHMA 630 (US32D)
 2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
 3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
 4. Protection Plates: BHMA 630 (US32D)
 5. Overhead Stops and Holders: BHMA 630 (US32D)
 6. Door Closers: Powder Coat to Match
 7. Wall Stops: BHMA 630 (US32D)
 8. Latch Protectors: BHMA 630 (US32D)
 9. Weatherstripping: Clear Anodized Aluminum
 10. Thresholds: Mill Finish Aluminum

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Where on-site modification of doors and frames is required:
 1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
 2. Field modify and prepare existing door and frame for new hardware being installed.
 3. When modifications are exposed to view, use concealed fasteners, when possible.
 4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
 - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
 - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying section.
- I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
 - 1. Conduit, junction boxes and wire pull.
 - 2. Connections to and from power supplies to electrified hardware.
 - 3. Connections to fire/smoke alarm system and smoke evacuation system.
 - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 - 5. Testing and labeling wires with Architect's opening number.
- J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
- L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
 - 1. Coordination: Coordinate provision with the security systems provider to mitigate excessive or redundant purchase.
 - 2. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.
- N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard. Locate no more than 4 inches from walls.
- P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- R. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 ADJUSTING

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

2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.05 CLEANING AND PROTECTION

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

3.06 DEMONSTRATION

- A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.07 DOOR HARDWARE SCHEDULE

- A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.
- C. Hardware Sets: See below.

Abbreviation	Name
ADA	Adams Rite Manufacturing Co
B/O	By Others
IVE	H.B. Ives
LCN	LCN Commercial Division
SCE	Schlage Electronic Security
SCH	Schlage Lock Company
VON	Von Duprin
ZER	Zero International Inc

LEGEND:

☐ LINK TO CATALOG CUT SHEET

~ELECTRIFIED OPENING

HARDWARE GROUP NO. 01

FOR USE ON DOOR #(S):

1112C					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	☐		630	IVE
1	EA	POWER TRANSFER	EPT10 CON	☐	~	689	VON

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	ELEC PANIC HARDWARE	RX-AX-98-L- M996-06-FSE- CON	☐	~	626	VON
1	EA	RIM CYLINDER	20-057	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	FLOOR STOP	FS444	☐		626	IVE
1	EA	RAIN DRIP	142AA (OMIT IF SHELTERED)	☐		AA	ZER
1	SET	GASKETING	50AA-S	☐		AA	ZER
1	EA	DOOR SWEEP	39A	☐		A	ZER
1	EA	THRESHOLD	545A (OR AS DETAILED)	☐		A	ZER
1	EA	WIRE HARNESS (DOOR)	CON XX-XX				VON
1	EA	WIRE HARNESS (FRAME)	CON-6W				VON
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR				B/O
1	EA	DOOR CONTACT	679-05 COORDINATE W/ SECURITY CONTRACTOR	☐	~	BLK	SCE
1	EA	POWER SUPPLY	PS902 900- 2RS 120/240 VAC	☐	~		VON

HARDWARE GROUP NO. 02

FOR USE ON DOOR #(S):

1115A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP	☐		630	IVE

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	POWER TRANSFER	EPT10 CON	☐	~	689	VON
1	EA	ELEC PANIC HARDWARE	RX-AX-98-L- M996-06-FSE- CON	☐	~	626	VON
1	EA	MORTISE CYLINDER	20-061	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	FLOOR STOP	FS444	☐		626	IVE
1	EA	RAIN DRIP	142AA (OMIT IF SHELTERED)	☐		AA	ZER
1	SET	GASKETING	50AA-S	☐		AA	ZER
1	EA	DOOR SWEEP	39A	☐		A	ZER
1	EA	THRESHOLD	545A (OR AS DETAILED)	☐		A	ZER
1	EA	WIRE HARNESS (DOOR)	CON XX-XX				VON
1	EA	WIRE HARNESS (FRAME)	CON-6W				VON
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR				B/O
1	EA	DOOR CONTACT	679-05 COORDINATE W/ SECURITY CONTRACTOR	☐	~	BLK	SCE
1	EA	POWER SUPPLY	PS902 900- 2RS 120/240 VAC	☐	~		VON

HARDWARE GROUP NO. 04

FOR USE ON DOOR #(S):

120A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
DOOR HARDWARE
08 71 00 -18

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	☐		630	IVE
1	EA	POWER TRANSFER	EPT10 CON	☐	~	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX CON 12/24 VDC	☐	~	626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	FLOOR STOP	FS444	☐		626	IVE
1	EA	RAIN DRIP	142AA (OMIT IF SHELTERED)	☐		AA	ZER
1	SET	GASKETING	50AA-S	☐		AA	ZER
1	EA	DOOR SWEEP	39A	☐		A	ZER
1	EA	THRESHOLD	545A (OR AS DETAILED)	☐		A	ZER
1	EA	WIRE HARNESS (DOOR)	CON XX-XX				VON
1	EA	WIRE HARNESS (FRAME)	CON-6W				VON
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR				B/O
1	EA	DOOR CONTACT	679-05 COORDINATE W/ SECURITY CONTRACTOR	☐	~	BLK	SCE
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		~		B/O

HARDWARE GROUP NO. 05

FOR USE ON DOOR #(S):

114A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	POWER TRANSFER	EPT10 CON	☐	~	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX CON 12/24 VDC	☐	~	626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	☐		630	IVE
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
3	EA	SILENCER	SR64	☐		GRY	IVE
1	EA	WIRE HARNESS (DOOR)	CON XX-XX				VON
1	EA	WIRE HARNESS (FRAME)	CON-6W				VON
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR				B/O
1	EA	DOOR CONTACT	679-05 COORDINATE W/ SECURITY CONTRACTOR	☐	~	BLK	SCE
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		~		B/O

HARDWARE GROUP NO. 06

FOR USE ON DOOR #(S):

115A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE
1	EA	POWER TRANSFER	EPT10 CON	☐	~	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX CON 12/24 VDC	☐	~	626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER
1	EA	DOOR BOTTOM	360AA (AS REQ'D)	☐		AA	ZER
1	EA	THRESHOLD	164A (OR AS DETAILED)	☐		A	ZER
1	EA	WIRE HARNESS (DOOR)	CON XX-XX				VON
1	EA	WIRE HARNESS (FRAME)	CON-6W				VON
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR				B/O
1	EA	DOOR CONTACT	679-05 COORDINATE W/ SECURITY CONTRACTOR	☐	~	BLK	SCE
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		~		B/O

***CONFIRM HW COMPATIBILITY AND ACOUSTIC STC RATING REQUIREMENT WITH ACOUSTIC DOOR MFG./ SUPPLIER.**

HARDWARE GROUP NO. 07

FOR USE ON DOOR #(S):

1105A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	☐		652	IVE
1	EA	FIRE EXIT HARDWARE	AX-98-L-BE-F- 06	☐		626	VON
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER

HARDWARE GROUP NO. 08**FOR USE ON DOOR #(S):**

1103A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	☐		652	IVE
1	EA	FIRE EXIT HARDWARE	AX-98-L-F-06	☐		626	VON
1	EA	RIM CYLINDER	20-057	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER

HARDWARE GROUP NO. 09**FOR USE ON DOOR #(S):**

1105B					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	☐		652	IVE
1	EA	PANIC HARDWARE	AX-98-L-BE-06	☐		626	VON
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER
1	EA	DOOR BOTTOM	355AA	☐		AA	ZER

HARDWARE GROUP NO. 10**FOR USE ON DOOR #(S):**

1102A	1211A				

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	☐		630	IVE
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER

HARDWARE GROUP NO. 11

FOR USE ON DOOR #(S):

118A	1109A	1210A			

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
3	EA	SILENCER	SR64	☐		GRY	IVE

HARDWARE GROUP NO. 12

FOR USE ON DOOR #(S):

1101A	1206A	1208A			

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9040 06A 09- 544 OS-OCC IS-LOC	☐		626	SCH

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	☐		630	IVE
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER
1	EA	COAT AND HAT HOOK	571 ADD 1 @ 43" IF ADA	☐		626	IVE

HARDWARE GROUP NO. 13

FOR USE ON DOOR #(S):

111A	112A	113A			

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9040 06A 09- 544 OS-OCC IS-LOC	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	☐		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	☐		630	IVE
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER
1	EA	DOOR BOTTOM	360AA (AS REQ'D)	☐		AA	ZER
1	EA	COAT AND HAT HOOK	571 ADD 1 @ 43" IF ADA	☐		626	IVE

***CONFIRM HW COMPATIBILITY AND ACOUSTIC STC RATING REQUIREMENT WITH ACOUSTIC DOOR MFG./ SUPPLIER.**

HARDWARE GROUP NO. 14

FOR USE ON DOOR #(S):

1104A	1110A	1113A	1114A	1207A	1212A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE
1	EA	CLASSROOM LOCK W/ OUTSIDE INDICATOR	L9070T 06A OS-LOC	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER

HARDWARE GROUP NO. 15**FOR USE ON DOOR #(S):**

119A						

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE
1	EA	OFFICE/ENTRY LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9050T 06A 09- 544 OS-LOC IS-LOC	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
3	EA	SILENCER	SR64	☐		GRY	IVE

HARDWARE GROUP NO. 16**FOR USE ON DOOR #(S):**

1202A	1203A	1204A	1205A			

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	☐		652	IVE
1	EA	OFFICE/ENTRY LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9050T 06A 09- 544 OS-LOC IS-LOC	☐		626	SCH

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER

HARDWARE GROUP NO. 17

FOR USE ON DOOR #(S):

1201A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	☐		630	IVE
1	EA	DBL CYL STORE W/DB W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9466T 06A OS-LOC IS- LOC	☐		626	SCH
2	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (AS REQ'D)	☐		689	LCN
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	EA	GASKETING	488SGY PSA	☐		Gy	ZER

***PATIO LOCATION WITH DOUBLE KEYED CYLINDER, PLEASE CONSULT LIFE SAFETY AND ADVISE.**

HARDWARE GROUP NO. AL-01

FOR USE ON DOOR #(S):

100A	1100A				

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	PIVOT SET	7215 SET	☐		626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT X QTY (AS REQ'D)	☐		626	IVE
1	EA	POWER TRANSFER	EPT10 CON	☐	~	689	VON

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	ELEC PANIC HARDWARE	RX-QELX-AX- 98-NL-OP- 110MD-CON	☐	~	626	VON
1	EA	RIM CYLINDER	20-057	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 12" STD	☐		630-316	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH (PROVIDE MOUNTING BRACKETS, PLATES, AND ACCESSORIES AS REQ'D)	☐		689	LCN
1	EA	RAIN DRIP	142AA (OMIT IF SHELTERED)	☐		AA	ZER
1	SET	GASKET AND SEAL	BY STOREFRONT MFG./ SUPPLIER			AA	B/O
1	EA	DOOR SWEEP	39A	☐		A	ZER
1	EA	THRESHOLD	545A (OR AS DETAILED)	☐		A	ZER
1	EA	WIRE HARNESS (DOOR)	CON XX-XX				VON
1	EA	WIRE HARNESS (FRAME)	CON-6W				VON
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR				B/O
1	EA	DOOR CONTACT	7764 COORDINATE W/ SECURITY CONTRACTOR	☐	~	628	SCE
1	EA	POWER SUPPLY	PS902 900- 2RS 120/240 VAC	☐	~		VON

***6" DOOR TOP RAIL AND 5" LOCK STILE REQUIRED FOR DOOR HARDWARE INSTALLATION.**

***DOOR TAG# 1100A TO OUTSWING TO RECEIVE PANIC HARDWARE.**

HARDWARE GROUP NO. AL-02

FOR USE ON DOOR #(S):

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
DOOR HARDWARE
08 71 00 -27

1213A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PIVOT SET	7215 SET	☐	626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT X QTY (AS REQ'D)	☐	626	IVE
1	EA	STOREFRONT DEADBOLT, HEADER AND THRESHOLD	MS1850S X 4016 X 4015	☐	628	ADA
2	EA	MORTISE CYLINDER	20-061	☐	626	SCH
1	EA	EXIT INDICATOR	4089	☐	130	ADA
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D) (X REQ'D CAM)	☐	626	SCH
1	EA	SIGN	20-0256 "THIS DOOR TO REMAIN UNLOCKED..."			ADA
1	EA	SURFACE CLOSER	4040XP SCUSH (PROVIDE MOUNTING BRACKETS, PLATES, AND ACCESSORIES AS REQ'D)	☐	689	LCN
1	EA	RAIN DRIP	142AA (OMIT IF SHELTERED)	☐	AA	ZER
1	SET	GASKET AND SEAL	BY STOREFRONT MFG./ SUPPLIER		AA	B/O
1	EA	DOOR SWEEP	39A	☐	A	ZER
1	EA	THRESHOLD	545A (OR AS DETAILED)	☐	A	ZER

***6" DOOR TOP RAIL AND 5" LOCK STILE REQUIRED FOR DOOR HARDWARE INSTALLATION.**

HARDWARE GROUP NO. AL-03

FOR USE ON DOOR #(S):

107A					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
DOOR HARDWARE
08 71 00 -28

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	PIVOT SET	7215 SET	☐		626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT X QTY (AS REQ'D)	☐		626	IVE
1	EA	CLASSROOM LOCK W/ OUTSIDE INDICATOR	L9070T 06A OS-LOC	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA (PROVIDE MOUNTING BRACKETS, PLATES, AND ACCESSORIES AS REQ'D)	☐		689	LCN
1	EA	WALL STOP	WS406/407CVX	☐		630	IVE
1	SET	GASKET AND SEAL	BY STOREFRONT MFG./ SUPPLIER			AA	B/O

***6" DOOR TOP RAIL AND 5" LOCK STILE REQUIRED FOR DOOR HARDWARE INSTALLATION.**
***VERIFY ACOUSTIC REQUIREMENTS WITH STOREFRONT MANUFACTURER.**

HARDWARE GROUP NO. AL-04

FOR USE ON DOOR #(S):

107B					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	PIVOT SET	7215 SET	☐		626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT X QTY (AS REQ'D)	☐		626	IVE
1	EA	CLASSROOM LOCK W/ OUTSIDE INDICATOR	L9070T 06A OS-LOC	☐		626	SCH
1	EA	PERMANENT CORE	23-030 EV D (AS REQ'D)	☐		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH (PROVIDE	☐		689	LCN

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
			MOUNTING BRACKETS, PLATES, AND ACCESSORIES AS REQ'D)				
1	SET	GASKET AND SEAL	BY STOREFRONT MFG./ SUPPLIER			AA	B/O

***6" DOOR TOP RAIL AND 5" LOCK STILE REQUIRED FOR DOOR HARDWARE INSTALLATION.
HARDWARE GROUP NO. GATE-01**

FOR USE ON DOOR #(S):

G-1, G-2, G-3							

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	SET	GATE HARDWARE	BY GATE DOOR MFG./ SUPPLIER			TBD	B/O

***PLEASE ADVISE IF MAN GATES REQUIRE EXIT DEVICE OR LOCKSET**

HARDWARE GROUP NO. R-UP-01

FOR USE ON DOOR #(S):

1110B	1112A	1112B	1112D	1112E	2001A		

PROVIDE EACH RU DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	ROLL UP DOOR HARDWARE	BY DOOR MFG.				B/O
1		PERMANENT CORE	AS REQU'D PER PROJECT STANDARD				B/O

***ROLL UP DOOR AND HARDWARE TO BE SUPPLIED BY DOOR MFG./ SUPPLIER.**

END OF SECTION

**SECTION 08 80 00
GLAZING**

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

1.02 RELATED DOCUMENTS

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

1.03 SECTION INCLUDES

- A. Clear float glass, tinted glass, frosted glass, mirrored glass and insulated glazing units (IGU).

1.04 RELATED SECTIONS

- A. Section 01 30 00 – Administrative Requirements.
- B. Section 07 92 00 – Joint Sealants.
- C. Section 08 11 13 – Hollow Metal Doors and Frames.
- D. Section 08 14 16 – Flush Wood Doors.
- E. Section 08 51 13 – Aluminum Windows.

1.05 QUALITY ASSURANCE

- A. In addition to complying with all pertinent codes and regulations, install all glass in accordance with the standards of the "Glazing Manual" and the "Glazing Sealing Systems Manual" of the Flat Glass Marketing Association (FGMA).

1.06 SUBMITTALS

- A. Submit complete materials list showing all items proposed to be furnished and installed under this Section.
- B. Submit product data demonstrating that all materials meet or exceed the specified requirements.
- C. Submit samples of all glazing material.

1.07 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

1.08 WARRANTY

- A. Warranty insulating glass units against material obstruction to vision (such as dust or film formation on inner glass surface) for a 10-year period following acceptance of the work.

PART 2 – PRODUCTS

2.01 GLAZING MATERIALS

- A. Primary Glass: Provide primary glass which complies with ASTM C1036 and ASTM C1048 requirements, including those indicated by reference to type, class, quality, and form.
- B. Insulating Glass: Provide pre-assembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E774 for

Issued for Construction

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Newport Beach Fire Station No. 1 and Library

GLAZING

Newport Beach, California

08 80 00 -1

performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant. All insulated glass units shall be CBA rated.

1. 1-inch insulating glass tested and approved in accordance with the sealed Insulating Glass Manufacturer's Association (SIGMA) requirements.
 2. Insulating glass shall be 1/4-inch tinted glass outboard, 1/2-inch airspace, and 1/4-inch clear glass inboard, unless noted otherwise.
 3. Provide insulated glazing for exterior windows and exterior hollow metal door lites as indicated on Door Schedule and Finish Schedule in Drawings. Refer to Section 08 11 13 – Hollow Metal Doors and Frames for additional requirements.
 - a. Provide "Solarban 70" at insulated glazing for Hollow Metal Door lites.
 4. Provide glazing materials meeting the requirements specified in Section 08 51 13 – Aluminum Windows.
 - a. Provide "Solarban 70" at insulated glazing for Aluminum Windows.
 5. Provide glazing with a minimum SHGC of 0.4
 6. Provide glazing with a minimum U-value of 0.32
- C. Provide tempered glass where indicated or required by code.
- D. Mirror Glass: ASTM C1036, Type 1, Flat, Class 1, q1 mirror select, 1/4-inch thick minimum with pressure sensitive adhesive coated scrim impregnated film tape safety backing.
- E. Frosted Glass: Sandblasted, where indicated in the drawings, provide frosted glass, tempered or laminated when required.
- F. Fire-Rated Glazing: 3/16-inch FireLite glazing, Standard grade, with 45-minute rating.

2.02 GLAZING COMPOUNDS AND SEALANTS

- A. Use glazing compounds and preformed glazing sealants approved for the application and, except as otherwise specified, conforming to the Glazing materials portion of the FGMA Glazing Manual.

2.03 GLAZING ACCESSORIES

- A. Provide all glazing accessories required to supplement those accessories which accompany the items to the glazed, and as needed to provide a complete installation, including glazing points, clips, shims, angles, beads, settling blocks, and spacer strips.
- B. Provide glazing accessories according to the Manufacturer's requirements of the item in which the glazing will be used.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Insulating Glass: Comply with combined printed recommendations of insulating glass manufacturers and manufacturers of sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those of the referenced standards.
- B. Install glazing in locations indicated on drawings.
- C. Fix movable items securely, or in a closed and locked position, until glazing compound has thoroughly set.
- D. Glass setting:

1. Items to be glazed shall be shop-glazed or field-glazed with glass of the quality and thickness specified.
2. Prepare surrounds and glass, unless otherwise directed, in conformance with the details and general conditions governing glazing in the FGMA Glazing Manual.

3.03 CLEANING

- A. Prior to acceptance of the Work, thoroughly clean all glass and remove all labels, paint spots, sealants, and other defacements.

END OF SECTION

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**SECTION 08 90 00
LOUVERS AND VENTS**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Horizontal Drainable Fixed-Blade louvers, vents and accessories.

1.03 RELATED SECTIONS

- A. Section 04 29 00 – Reinforced Unit Masonry
- B. Section 07 62 00 - Sheet Metal Flashing and Trim
- C. Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)

1.04 REFERENCES

- A. AMCA 500-L Laboratory Methods of Testing Louvers for Rating.
- B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): Architectural Sheet Metal Manual.
- C. ASTM B209/B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM B211/B211M Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 Administrative Requirements.
- B. Product Data: Manufacturer's data sheets for each product and assembly specified.
- C. Shop Drawings: For units and accessories. Include plans; elevations; sections; and details showing profiles, angles, and spacing of elements. Show unit dimensions related to wall openings and adjacent construction; free area for each size indicated for louvers; profiles of frames at jambs, heads, and sills; and anchorage details and locations.
- D. Selection Samples: Two complete color charts showing the full range of colors available for units with factory-applied color finishes.
- E. Samples for Verification: For each finish specified, two samples representing actual finishes specified; prepared on Samples of same thickness and material indicated for final Work.

1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain products through one source from a single manufacturer where alike in one or more respects regarding type, design, or factory-applied color finish.
- B. SMACNA Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.
- C. AMCA Standard 500-L: Air performance, water penetration and air leakage ratings shall be determined in accordance with Air Movement and Control Association International Inc (AMCA) Standard 500, "Laboratory Methods of Testing Louvers for Rating."

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.
- B. Store products indoors in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.
- C. Handling: Protect materials and finishes during handling and installation to prevent damage.

1.08 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty for louver systems for a period of 1 year from date of installation, no more than 18 months after shipment from manufacturing plant. When notified in writing from the Owner of a manufacturing defect, manufacturer shall promptly correct deficiencies without cost to the Owner.
- B. Manufacturer's Finish Warranty: Provide manufacturer's limited warranty for powder-coated finish on aluminum substrates. Finish coating shall not peel, blister, chip, crack, or check.
 - 1. Warranty Period: 20 years.

PART 2 – PRODUCTS

2.01 HORIZONTAL DRAINABLE FIXED-BLADE LOUVERS

- A. Manufacturers: Subject to compliance with requirements, provide high performance, drainable horizontal fixed-blade louvers, Model A4097, as manufactured by Greenheck, or approved equal. Size shall be as indicated on Drawings.
- B. Materials:
 - 1. Aluminum Extrusions: ASTM B211, Alloy 6063-T5, 6063-T6 or 6061-T6.
 - 2. Aluminum Sheet: ASTM B209, Alloy 1100, 3003 or 5005.
- C. Finish:
 - 1. Louvers to be finished with a minimum 1.5-mil thick full strength 70-percent resin, 3-coat Fluoropolymer system.
 - 2. All aluminum shall be thoroughly cleaned, etched, and given a chromated conversion pre-treatment before application of the Kynar coating. The coating shall consist of a primer, a high metallic color coat and a clear PVF2 topcoat. All finishing procedures shall be one continuous operation in the plant of the manufacturer.
 - 3. Color as indicated on Louver Schedule and Finish Schedule in Drawings.
- D. Accessories:
 - 1. Bird Screens: Unless otherwise indicated, all louvers to be furnished with mill finish bird or insect screens. Screens to be 5/8-inch mesh, 0.050-inch thick expanded and flattened aluminum bird screen secured within 0.055-inch thick extruded aluminum frames. Frames to have mitered corners and corner locks.

2.02 GABLE VENTS

- A. Manufacturers: Subject to compliance with requirements
 - 1. Aluminum wall mounted vents with painted finish; color per the Architect.
 - 2. Design and size to meet requirements in the drawings.
- B. Accessories:
 - 1. Screens: Unless otherwise indicated, all louvers to be furnished with mill finish bird or insect screens.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine openings to receive the work. Do not proceed until any unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of the work.
- B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated, and fitted to the structure.
- C. Install louvers as indicated and as shown in shop drawings. Coordinate installation with other trades, including mechanical ductwork and fans.
- D. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove

and replace members where cutting and trimming has impaired the strength or appearance of the assembly.

- E. Do not erect warped, bowed, deformed, or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
- F. Set units level, plumb and true to line, with uniform joints.

3.03 CLEANING

- A. Immediately clean exposed surfaces of the louvers to remove fingerprints and dirt accumulation during the installation process. Do not let soiling remain until the final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to the material finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers and accessory components damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the Architect, remove damaged materials, and replace with new materials.
 - 1. Touch up minor abrasions in finishes with a compatible air-dried coating that matches the color and gloss of the factory applied coating.

END OF SECTION

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SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal furred out wall framing.
- B. Framing accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wall sheathing.
- B. Section 07 84 00 - Firestopping: Sealing top-of-wall assemblies at fire-resistance-rated walls.
- C. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.
- D. Section 08 31 00 - Access Doors and Panels.
- E. Section 08 51 13 - Aluminum Windows: Product requirements for window anchors.
- F. Section 09 29 00 - Gypsum Board: Execution requirements for anchors for attaching work of this section.

1.03 REFERENCE STANDARDS

- A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- C. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.
- D. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data describing framing member materials and finish, product criteria, and limitations.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Provide mock-up of framing including insulation, sheathing, window frame, and door frame and finish specified in other sections. Coordinate with installation of associated work specified in other sections.
 - 1. Mock-up Size and Location: As required by the Architect.
 - 2. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 - 1. Basis of Design: ClarkDietrich www.clarkdietrich.com/#sle.

2.02 FRAMING MATERIALS

- A. Non-Loadbearing Framing System Components: sheet steel, of size and properties necessary for the spacing indicated.
 - 1. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

2. Resilient Channels: RC Deluxe Resilient Channel, Single or double leg configuration; 1/2 inch channel depth.
3. Metal Studs: ProStud, 1-5/8 inch.

B. Substitutions: See Section 01 25 00 Substitution Procedures.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

- A. Install non-structural members in accordance with ASTM C754.
- B. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. Fire-Resistance-Rated Construction: Install framing and accessories in accordance with requirements of fire-resistance-rated assembly and to GA-600 requirements.
- E. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- F. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.
- G. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 22 26
METAL SUSPENSION SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes components for gypsum and plaster board assemblies

1.02 RELATED SECTIONS

- A. Section 09 29 00 - Gypsum Board
- B. Division 23 – Heating, Ventilating and Air Conditioning (HVAC)
- C. Division 26 – Electrical

1.03 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract apply to this section. This includes General and Supplementary Conditions of Division 01 Specification Sections.

1.04 REFERENCE STANDARDS

- A. ASTM A641 – Specification for Steel Sheet, Zinc-Coated (galvanized) Carbon Steel Wire
- B. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip Process
- C. ASTM A1008 – Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2024.
- E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- G. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- H. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures; 2006.
- I. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2
 - 1. California Dept. of Public Health CDPH/EHLB/Standard Method v1.2, 2017

1.05 SUBMITTALS

- A. Product Data
 - 1. Submit manufacturer's published technical information for each product indicated
- B. Shop Drawings
 - 1. Submit reflected ceiling plans drawn to scale prescribed by Architect
 - a. Include coordinated penetrations and ceiling-mounted items
 - b. Include any necessary details or drawings from the manufacturer regarding recommended installation
- C. Samples
 - 1. Submit 12 inch long samples of suspension system components, including main runner, cross tee, wall angle
 - 2. Submit representative manufacturer's sample of each suspension member indicated
- D. Certifications
 - 1. Provide manufacturer's written certification that products submitted meet or exceed all specified requirements

2. Provide third party verified life cycle information with published environmental product declaration (EPD)
 - a. Per ISO 14025 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures

1.06 QUALITY ASSURANCE

- A. Source Limitations
 1. Drywall Suspension System
 - a. Obtain all drywall framing components through one source from a single manufacturer
- B. Installer Qualifications
 1. Must be experienced in the installation of systems similar to those specified herein
- C. Fire Resistance Ratings
 1. When drywall ceiling is functioning as the fire protective barrier, specific performance is referenced in UL Fire Resistance Directory, tested according to ASTM E119. Installation in accordance with specific UL Design referenced.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Delivery of drywall suspension system will be in the original unopened packages with the manufacturer's label intact
- B. Handling and storage should be in accordance with the manufacturer's Safety Data Sheets (SDS)
- C. Product cartons should be handled carefully to avoid damage

1.08 COORDINATION

- A. Coordinate the installation of the drywall suspension system with any and all trades whose work is impacted by that installation

1.09 EXTRA MATERIALS

- A. Provide extra materials in the manufacturer's unopened packaging, with the manufacturer's label intact, as detailed below
 1. Suspension System Components – Minimum 5% of each type installed

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Basis of Design: CertainTeed Architectural; www.certainteed.com/architectural
- B. Substitutions: See Section 01 25 00 - Substitution Procedures

SUSPENSION SYSTEM

- A. Product
 1. Name: 1-1/2" Drywall Suspension System
- B. Physical Characteristics
 1. Double web design manufactured of hot-dipped galvanized steel
 2. Knurled face for ease of screw installation
 3. Heavy-duty materials for maximum rigidity and screw grip
 4. 0.020" metal thickness
 5. Cross-tees feature staked-on end tabs to facilitate tightness, ease of installation
 6. System incorporates G40 hot-dipped galvanization as standard galvanization
 - a. G90 available on all components for extreme or exterior environments
 7. Tee height: 1-19/32"
 8. Flange size: 1-1/2"
 9. Recycled content:
 - a. Main Runners: 88%

- 1) 19% (pre-consumer)
 - 2) 69% (post-consumer)
 - b. Cross Tees: 87%
 - 1) 19% (pre-consumer)
 - 2) 68% (post-consumer)
 - c. Wall Angle: 88%
 - 1) 19% (pre-consumer)
 - 2) 69% (post-consumer)
- C. Available Components
 - 1. Main Runners
 - a. Size: 144"
 - 2. Cross Tees:
 - a. Size: 14", 24", 26", 36", 48", 50", 72"
 - 3. Wall Molding
 - a. Type: angle
 - b. Profile 90° L-angle
 - c. Size: 144"
 - 4. Terminus Drywall Perimeter Trim
 - a. Drywall Straight
 - 1) TTDW-2 WHT
 - (a) Size: L:120" x H:2.688" x F:1"
 - 2) TTDW-4 WHT
 - (a) Size: L:120" x H:4.688" x F:1"
 - 3) TTDW-6 WHT
 - (a) Size: L:120" x H:6.688" x F:1"
 - 4) TTDW-8 WHT
 - (a) Size: L:120" x H:8.688" x F:1"
 - b. Drywall Curved
 - 1) TTDWR-2
 - (a) Size: L:120" x H:2.688" x F:1"
 - 2) TTDWR-4
 - (a) Size: L:120" x H:4.688" x F:1"
 - 3) TTDWR-6
 - (a) Size: L:120" x H:6.688" x F:1"
 - 4) TTDWR-8
 - (a) Size: L:120" x H:8.688" x F:1"
 - c. Drywall Corners
 - 1) TTDWCKI-2 WHT
 - (a) Size: L:2" x H:2.688" x F:1"
 - 2) TTDWCK0-2 WHT
 - (a) Size: L:2" x H:2.688" x F:1"
 - 3) TTDWCKI-4 WHT
 - (a) Size: L:2" x H:4.688" x F:1"
 - 4) TTDWCK0-4 WHT
 - (a) Size: L:2" x H:4.688" x F:1"
 - 5) TTDWCKI-6 WHT
 - (a) Size: L:2" x H:6.688" x F:1"
 - 6) TTDWCK0-6 WHT
 - (a) Size: L:2" x H:6.688" x F:1"
 - 7) TTDWCKI-8 WHT
 - (a) Size: L:2" x H:8.688" x F:1"
 - 8) TTDWCK0-8 WHT

(a) Size: L:2" x H:8.688" x F:1"

D. Structural Classification

1. Main Runners classified as heavy duty, per ASTM C635 and ASTM C645
 - a. For C635, suspension system deflection limited to L/360
 - b. For C645, suspension system deflection limited to L/240
2. Seismic Restraints: Pursuant to CISCA recommendations, ASTM E580 and local code requirements
3. ICC-ES Evaluation Service Report (ESR-3941)
 - a. Suspended Drywall Ceiling Framing System

E. Independent Certifications

F. VOC content

- a. Third-party certification of compliance
 - 1) Per California Dept. of Public Health CDPH/EHLB/Standard Method v1.2, 2017

G. Environmental Product Declaration

- a. Third-party verified Type III Environmental Product Declaration
 - 1) Per ISO 14025 - Environmental Labels and Declarations - Type III
Environmental Declarations -- Principles and Procedures

PART 3 – EXECUTION

4.01 EXAMINATION

- A. Ascertain acceptability of substrates and building conditions under which the ceiling system is to be installed. Do not proceed with the installation until any and all unacceptable conditions have been rectified. The system can be installed in both interior and exterior applications.

4.02 INSTALLATION

- A. Install the ceiling system in accordance with the following:
 1. Manufacturer's printed instructions
 2. ASTM C636
 3. Ceilings & Interior Systems Construction Association (CISCA) recommendations
 4. Applicable local code requirements
 5. Approved shop drawings

END OF SECTION

**SECTION 09 24 00
CEMENT PLASTERING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cement plastering.
- B. Lath, furring, beads, screeds, and joint accessories for plaster base.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood stud framing for plaster.
- B. Section 07 25 00 - Weather Barriers: Water-resistive barrier.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim
- D. Section 09 91 00 - Painting.

1.03 REFERENCE STANDARDS

- A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- B. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- C. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters; 2015 (Reapproved 2020).
- D. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2023a.
- E. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2023.
- F. ASTM C933 - Standard Specification for Welded Wire Lath; 2023.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.
- C. Samples:
 - 1. Submit two samples, 4 inch by 4 inch in size illustrating finish color and texture.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Mock-Up Panel: Construct a 8 foot wide by 6 foot high sample panel of plaster work at the jobsite demonstrating installation procedures, finish texture, and color. Show each phase of installation including framing and reinforcement.

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

- A. Lath Plaster Base: Metal lath.
 - 1. Plaster Type: Portland Cement Stucco.
 - 2. Number of Coats: Three.
 - 3. First Coat: Apply to a nominal thickness of 3/8 inch.
 - 4. Second Coat: Apply to a nominal thickness of 3/8 inch.
 - 5. Finish Coat: Apply to a nominal thickness of 1/8 inch.

- a. Texture: to match existing building.
 - B. Substrate: Concrete masonry with water resistive barrier.
- 2.02 JOBSITE MIXED CEMENT PLASTER
- A. Materials:
 - 1. Portland Cement: ASTM C150/C150M, Type I.
 - a. Finish Coat: White color.
 - 2. Sand: Clean, well graded, and complying with ASTM C897.
 - 3. Water: Clean, fresh, potable, and free of mineral or organic matter that could adversely affect plaster.
- 2.03 ACCESSORIES
- A. Lath:
 - 1. Wire Size: 17 gauge, 0.453 inch.
 - 2. Galvanized: ASTM A641/A641M.
 - 3. Opening Size: 11/16 by 1-1/2 inches.
 - 4. Comply with ASTM C933.
 - B. Finishing Accessories: ASTM C1063; vinyl or PVC plastic, galvanized metal, or zinc alloy according to manufacturer's recommendations.
 - 1. Shapes: As detailed or required to match historic appearance.
 - a. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead, L-bead, and shapes to match historic appearance of the building at exposed plaster edges.
 - C. Water-Resistive Barrier: See Section 07 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.
- C. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

3.02 PREPARATION

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Where cement plaster is installed as part of a barrier wall system, install two layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions.
- B. Integrate water-resistive barrier with flashing accessories for penetrations and transitions.
- C. Apply water-resistive barrier horizontally with upper layer lapped over lower layer at least 2 inches.
- D. Lap water-resistive barrier at least 6 inches at vertical joints.
- E. Lap water-resistive barrier at least 16 inches beyond vertical line of inside and outside corners in both directions.
- F. For two layer applications, start with two horizontal layers at bottom of exterior wall or structure.

3.04 MIXING

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.05 APPLICATION

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
Cement Plastering
09 24 00 -2

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.
- B. Base Coats:
 - 1. Apply base coat(s) to fully embed lath and to specified thickness.
 - 2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.
- C. Leveling Coat:
 - 1. Apply leveling coat to specified thickness.
- D. Finish Coats:
 - 1. Cement Plaster:
 - a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
 - b. Apply desired surface texture while mix is still workable.

3.06 TOLERANCES

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

3.07 REPAIR

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

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**SECTION 09 29 00
GYPSUM BOARD**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Gypsum wallboard as indicated on the drawings.
- B. Gypsum wallboard accessories.

1.02 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry
- B. Section 07 84 00 - Firestopping
- C. Section 07 92 00 - Joint Sealants
- D. Division 08 – Openings; including Doors, Windows, Vents, Louvers and Access Panels.
- E. Section 09 22 16 – Non-Structural Metal Framing
- F. Section 09 22 26 - Metal Suspension Systems
- G. Section 09 91 00 - Painting

1.03 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
- C. ASTM C473 - Standard Test Methods for Physical Testing of Gypsum Panel Products; 2024.
- D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.
- F. ASTM C1288 - Standard Specification for Fiber-Cement Interior Substrate Sheets; 2023.
- G. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- I. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- J. GA-214 - Levels of Finish for Gypsum Panel Products; 2021.
- K. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

1.04 SUBMITTALS

- A. Submit according to the provisions of Section 01 30 00 – Submittals.
- B. Product Data: Manufacturer's specifications and installation instructions for each product specified.
- C. Certifications: Provide certification that materials meet these specifications.
- D. Samples: Provide 8" X 10" samples of texture finishes for approval.

1.05 STORAGE AND HANDLING

- A. Deliver materials in manufacturer's unopened containers, packages or bundles identified with manufacturer's name, brand, type, and grade clearly marked. Comply with GA-216 and GA-801 and manufacturer's instructions. Take care to avoid impact, undue flexing, and damage to edges, ends and corners.

- B. Store in dry areas and protect from dampness and deterioration. Stack product flat on a level surface. As individual sheets are removed for installation, raise products carefully on edge and carry in a vertical position.
- C. Protect ready-mixed products from freezing.
- D. Protect metal products from rusting.
- E. Deliver fire-rated materials bearing testing agency label and required fire classification number.

1.06 PROJECT CONDITIONS

- A. Do not install gypsum wallboard products unless installation areas comply with minimum temperature and ventilation requirements recommended by manufacturer.
- B. Under slow drying conditions, allow additional drying time between coats of joint treatment.

1.07 WARRANTY

- A. Product Warranty: Limited product warranty against manufacturing defects.
- B. Workmanship Warranty: Application limited warranty for 1 years.

PART 2 – PRODUCTS

2.01 GYPSUM WALLBOARD

- A. Manufacturers: Subject to compliance with requirements, provide gypsum wallboard materials by Georgia Pacific, or equal, unless noted otherwise.
 - 1. See drawings for locations.
- B. Gypsum Wallboard:
 - 1. Standard: ASTM C1396/C1396M; or Fed. Spec. SS-L-30, Type III, Grade R, Class I; 5/8-inch-thick, tapered edges, ends square cut, maximum permissible lengths.
 - 2. Fire Resistant: ASTM E119, Type X or Type C as indicated in the Drawings.
 - a. Thickness: As required by each fire-resistance-rated assembly in the Drawings.
 - b. Fire Barrier Sealant: Non-Slump; intumescent sealant for joints and at all through penetrations as required by code and Authorities Having Jurisdiction, to prevent flame from spreading between spaces,
 - 3. Water Resistant: ASTM C630, tapered edges, ends square cut, maximum permissible lengths.
 - a. Thickness: As required by assembly in the Drawings.
 - b. Seal all edges per manufacturer's recommendations.
 - 4. Ceramic Tile Backer Board: Basis of Design "DensShield" by Georgia-Pacific, or equal. 5/8-inch thick unless noted otherwise.
 - a. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.
 - b. Install with 1/4-inch gap where panels abut other construction or penetrations.
 - 5. Acoustically Enhanced Gypsum Board: Basis of Design Silent FX QuickCut, 5/8-inch-thick, as manufactured by Certainteed, or approved equal.
 - a. For use in assembly requiring a minimum STC rating of 51. Provide framing, resilient channel, Sound attenuation blankets, or other materials as required to meet desired STC rating.
 - b. Acoustical Sealant: Non-hardening and permanently flexible sealant.
 - 1) With a continuous bead of acoustical sealant, seal construction at perimeters, behind control joints, and at openings and penetrations.
 - 2) Install acoustical sealant at both faces of partitions, at perimeters and through penetrations.
 - 3) Comply with ASTM C919-22 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
 - c. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

2.02 GYPSUM WALLBOARD ACCESSORIES

- A. Provide gypsum wallboard accessories in accordance with Gypsum Association GA-216, as shown on Drawings, and as specified.
- B. Provide all accessories such as corner beads and edge trim as metal fabrications, 26-gauge minimum.
- C. Joint Treatment:
 - 1. Tape: Perforated, conforming to ASTM C475 or Fed. Spec. SS-J-570, Type II.
 - 2. Compound: Powdered or ready-mixed conforming to ASTM C475 or Fed. Spec. SS-J-570, Type I. Taping and topping joint compound or all-purpose joint compound may be used.
- D. Surface Coat: Prep Coat by Hamilton Drywall Products, or equal.
- E. Wall Texturing: Provide materials manufactured by U.S. Gypsum, or equal.
- F. Ceiling Texturing: Provide materials manufactured by U.S. Gypsum, or equal.
- G. Provide 1-1/2" furring / hat channel or resilient channel, 25 gauge min. with G60 coating, where shown in the drawings to furr out masonry walls.

PART 3 – EXECUTION

3.01 COORDINATION

- A. Coordinate installation of bucks, anchors, blocking, electrical and mechanical work which is to be placed in or behind framing and gypsum wallboard. Allow such items to be installed after framing is completed.

3.02 MISC. FRAMING INSTALLATION

- A. Install furring hat channel and anchors per manufacturer instructions.

3.03 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with Gypsum Association GA-216 recommendations.
- B. Erect gypsum board across studs with ends and edges occurring over continuous firm bearing, in direction most practical.
- C. Erect fire-rated assemblies in accordance with CBC requirements for Fire Rated assemblies.
- D. Use screws when fastening gypsum board to framing.
- E. Hang ceiling and soffit systems level and plumb, in true alignment with adjacent surfaces and walls.
- F. Construct tight fitting joints in exposed ceiling members, continuously around openings and obstructions.
- G. Tape, fill, and sand exposed joints, edges, corners, and openings to produce surfaces ready to receive finishes except at non-exposed-to-view conditions. Feather coats onto adjoining surfaces so that camber is maximum of 1/16-inch.
 - 1. Finishing of taping is not required at areas to receive tiles, and areas above exposed-to-view ceilings.
- H. Apply Surface Coat over taped joints and gypsum board to provide a uniform, smooth surface, prepared for paint.
- I. Remove and correct or replace defective work in a manner acceptable to the Architect.

3.04 TILE BACKER BOARD INSTALLATION

- A. Install in wet areas as indicated in accordance with manufacturer's instructions.
- B. Treat cut edges and holes in water-resistant gypsum board with sealant.

3.05 TRIM

- A. Apply edge casing plumb and true to all openings and exposed ends of wallboard abutting another material or as specifically detailed otherwise. Use continuous lengths where possible.
- B. Apply corner bead plumb and true to all exposed exterior corners in continuous lengths whenever possible.
 - 1. Place corner beads and trim/molds as shown or required. Use longest practical lengths. Place edge trim and molds where gypsum board abuts dissimilar materials and at all board terminations exposed to view.
 - 2. Construct reveals required by Drawings.
- C. The drawings do not purport to show all locations and all requirements for metal trim in connection with the work of this Section. Carefully study the drawings and the job conditions; provide in place, all metal trim recommended by the manufacturer of the gypsum wallboard used and as required for a finished installation.

3.06 APPLICATION OF TEXTURE FINISH

- A. Finish: All wall surfaces shall receive a "Level 4" smooth finish, unless noted differently in the drawings.
 - 1. Gypsum Board finish shall be inspected by Architect to approve.
- B. Application: Apply Surface Coat finish to drywall and other surfaces indicated in strict accordance with manufacturer's instructions to produce a uniform finish.
 - 1. Apply Surface Coat evenly to ensure taped joints and drywall surface material will accept paint equally and will not appear as different textures through the paint.
 - 2. Finish shall be smooth to provide an even Level 4 finish.
- C. Remove any droppings or overspray from door frames, windows, and other adjoining work.

END OF SECTION

**SECTION 09 30 13
CERAMIC TILING**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Interior Porcelain tile for floors.
- B. Tiling accessories.
- C. Wall Base at select locations. See Drawings and Section 06 20 00 Finish Carpentry.

1.02 RELATED DOCUMENTS

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

1.03 RELATED SECTIONS

- A. Section 07 92 00 - Joint Sealants
- B. Section 09 29 00 - Gypsum Board

1.04 REFERENCE STANDARDS

- A. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2023.
- B. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2023.
- C. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.
- D. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- E. Tile Council of America, Inc. (TCA): Handbook for Ceramic Tile Installation, current edition.

1.05 SUBMITTALS

- A. Samples: Submit in duplicate.
 - 1. Floor Tile: Three tiles for each color and type.
 - 2. Trim Shapes: Three samples of each color, type and shape.
 - 3. Grout: Each color selected.
 - 4. Transition Strips: Three samples of each type and color selected.
- B. Certificates:
 - 1. Master Grade Certificates:
 - a. Conform to ANSI A137.1.
 - b. State grade, kind of tile, identification marks or tile packages, and name and location of project.
 - c. Issued and signed by manufacturer when tile is shipped.
- C. Manufacturer's Data: Submit manufacturer's data for all items to be supplied under this section of work.
- D. Manufacturer's Instructions: Furnish manufacturer's instructions for use of mortars, adhesives, and grouts.
- E. Shop Drawings: Submit shop drawings indicating tile pattern layout and layout of all expansion joints. Resubmitting copies of Architectural plans will not be acceptable.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original sealed containers.
 - 1. Labels legible and intact identifying brand name and contents.
 - 2. Tile cartons grade-sealed by manufacturer in accordance with ANSI A137.1.
 - 3. Grade-seals unbroken.

4. Manufactured mortars and grouts to contain hallmarks certifying compliance with reference standards and be types recommended by tile manufacturer for application.

B. Store materials under cover in manner to prevent damage or contamination.

1.07 JOB CONDITIONS

A. Environmental:

1. Install mortar, set and grout tile when surface temperature is minimum 50°F (10°C) and rising but no more than 90°F (32°C).
2. Do not install mortar, set or grout tile when inclement weather conditions are expected within 48 hours after work is completed.
3. Protection: Protect adjoining work surfaces before tile work begins.

1.08 EXTRA STOCK

A. Provide owner with an additional five percent of each type of tile in unopened packages clearly labeled.

PART 2 – PRODUCTS

2.01 INTERIOR FLOOR TILE

A. Porcelain floor tile:

1. Basis-of-Design Product: Crossville, Dal-Tile Corporation, or equal.
2. Subject to compliance with requirements, provide glazed porcelain tile as noted in the Finish Schedule.
3. Surface: Having a dynamic coefficient of friction not less than 0.42.
4. Size, Style and Color: See Finish Schedule in Drawings.
5. Wall Base: Solid Surface Material, 4" H by ½" T, color to be selected by Architect.

2.02 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16-inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2-inch or less above adjacent floor surface.

2.03 SETTING MATERIALS

A. Portland Cement Mortar Installation Materials: Provide materials to comply with ANSI A108.1 as required for installation method designated, unless otherwise indicated.

B. Thin-Set Portland Cement Mortar: Where thinset portland cement mortar applications are indicated, use the following unless otherwise indicated:

1. Laticrete 255, Multimax Multipurpose Thin Set Mortar, ANSI A118.4, by Laticrete International, or equal.

2.04 GROUTING MATERIALS

A. Epoxy Grout: Proprietary two component pre-blended compound of portland cement, selected and graded aggregates, color pigments, resin and hardener and chemical additives gaged with latex additive to comply with manufacturer's directions.

B. Manufacturers: Custom Building Products, or equal, per manufacturer's instructions.

1. Grout shall be non-sanded.
2. Color: As selected by Architect from manufacturer's full range of standard colors.
3. Joint Width: All joints between tiles shall be 1/8-inch unless noted otherwise.

2.05 MISCELLANEOUS MATERIALS

A. Sealants: Refer to Section 07 92 00 – Joint Sealants.

B. Membrane for scratch coat to wood framing and for cleavage membrane: polyethylene film, 4 mil at walls and 10 mil at floors.

- C. Waterproofing membrane at floors to receive tile: Hydro Ban Waterproofing by Laticrete, or equal.
 - 1. Provide all related materials for crack treatment, anti-fracture membrane, etc. as required by manufacturer.
- D. Transition Strip: Metal transition trim, by Schluter Systems, 1/8-inch thick, clear satin anodized aluminum. Contractor to use appropriate Schluter strip relative to thickness of tile.
- E. Tile Cleaner: Product specifically acceptable to manufacturer of tile sealer, tile and grout manufacturer for application indicated. "Stone & Tile Stripper", By TileLab, or equal.
- F. Grout Sealer: "SurfaceGard Sealer", by TileLab, or equal.
- G. Grout Release: Glaze-N-Seal, AquaMix, or equal.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard (ANSI AN-3 and A-3).
- B. Condition of surface to receive tile:
 - 1. Assure that surfaces to receive tile are stable, flat, firm, dry, clean and free of oil, waxes and curing compounds or any material that would interfere with direct bonding.
 - 2. Protect adjacent surfaces prior to beginning tile work.

3.02 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".
- B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation (latest adopted edition)"; comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.
- C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.
- E. Jointing Pattern: Unless otherwise shown or scheduled, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.
 - 1. Laying Out Tilework: Lay out work so that, as far as possible, no tile less than half full size occurs. For heights stated in feet and inches on the drawings, maintain full courses to produce the nearest obtainable height using standard bases and trim. Lay out tiles on walls so that fields and patterns center exactly on individual wall areas.
- F. For tile mounted in sheets make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.
- G. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction and isolation joints, where indicated, or if not indicated, at no more than 24 feet on center in each direction, and as recommended in TCA "Handbook for Ceramic Tile Installation", and approved by Architect.

1. Joints must be carried through all layers of installation materials, including tile, directly over joints in substrate. Provide additional joints in tile work to align with all structural joints in concrete slabs.
 2. Where joints in slab do not correspond to joints in tile work, provide manufacturer's recommended slip sheet to bridge over joints in slab.
 3. Prepare joints and apply sealants to comply with requirements of referenced standards and sealant manufacturer.
- H. Grout tile to comply with referenced installation standards, using grout materials indicated.
1. Apply grout release prior to grouting in accordance with manufacturer's recommendations.
- I. Mix and install proprietary components to comply with grout manufacturer's directions.

3.03 FLOOR INSTALLATION METHODS

- A. Ceramic or Porcelain Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:
1. All supporting surfaces shall be structurally sound, solid, stable, level, plumb, and true to a tolerance in plane of 1/8-inch in 8-feet for walls, 1/8-inch in 10-feet for floors, thin-set method, or 1/4-inch in 10-feet, mortar bed method. They shall be clean and free of dust, oil, grease, paint, tar, wax, curing compound, primer, sealer, form release agent, laitance, loosely bonded topping, loose particles or any deleterious substance and debris which may prevent or reduce adhesion.
 2. Mechanically sand and scarify the substrate to completely remove all paint, loosely bonded topping, loose particles and construction debris.
 3. Before work commences examine the areas to be covered and report any flaw or adverse condition in writing to the Architect and to the general contractor. Do not proceed with work until surfaces and conditions comply with the requirements indicated in ANSI A108 specifications.
- B. Portland Cement Mortar: ANSI A108.1.
1. Concrete Subfloors, Interior: TCA F112.
 2. Grout: Epoxy grout.
- C. Thin-set Portland Cement Mortar: ANSI A118.4.
1. Concrete Subfloors, Interior: TCA F113.
 2. Grout: Epoxy grout.

3.04 GROUT

- A. Install grout in accordance with ANSI108.10 - 1999 and manufacturer's directions.
1. Proper curing of grout entails covering installation with non-staining kraft paper for a period of 72 hours.

3.05 TILE AND GROUT SEALING

- A. Before Grouting: Apply tile sealer to all surfaces prior to grouting to allow for easy clean-up after grouting. Apply material according to manufacturer's recommendations.
- B. After Grouting: After removing all excess residue and haze from tiles per manufacturer's recommendations, apply tile sealer to all grout joints and complete tile surfaces per manufacturer's recommendations.

3.06 SEALANTS

- A. After curing, remove spacers, and dry and clean all joints requiring caulking. Prime all joints to be caulked with primer recommended by the manufacturer of the caulking. Caulking shall be expertly applied, beaded smooth and concave, without protruding beyond adjacent surfaces. Caulking shall match color of grout in adjacent joints.

3.07 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all tile surfaces in accordance with manufacturer's recommendations so they are free of foreign matter. Polish tiles with dry, clean cloth (cheese cloth is recommended).
- B. Unglazed tile shall be cleaned with acid solutions when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
- C. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.
- D. Protection: Apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage and wear.
- E. Prohibit foot and wheel traffic from using tiled floors for at least 7 days after grouting is completed.
- F. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

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**SECTION 09 44 00
EPOXY CEMENT SYSTEM**

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.02 SUMMARY

- A. 3/8" Nominal Epoxy Cement Matrix. (Indicated on Drawings as: (Samples #25-020a-sd, 25-020b-sd) for a specific color.
- B. Work Included in this Section
 - 1. 3/8" Epoxy Cement topping poured in place with joint edge, and termination divider strips as indicated on drawings.
 - 2. Crack suppression membrane with reinforcing mesh if needed.
 - 3. Moisture Vapor Transmission Barrier Placed on Concrete Slab if needed.
- C. Related work in other Sections
 - 1. Cast-in-Place Concrete: Subfloor to be level with maximum variation of 1/4" in 10 feet, with a steel trowel finish surface. Concrete slab shall have effective moisture/vapor barrier placed beneath slab, free of damage causing tears or perforations.
 - 2. Adjacent floor finishes – see Division 9
 - 3. Furnish and placement of floor drains, plumbing fixtures, electrical fixtures.
 - 4. Joint sealants installed at expansion joints.
 - 5. Sufficient water, temporary heat and light, and adequate electric power connected with outlets within 100 feet of work area.

1.03 QUALITY ASSURANCE

- A. Quality Standards: The standards named herein are specified to establish standards of quality, performance and compliance with the design Epoxy Cement which is to duplicate the color of the approved "referee sample" available at (location).
- B. The Epoxy Cement System is provided by:
 - 1. Frank Klemaske, T.B. Penick & Sons, Inc., 15435 Innovation Drive, San Diego, California 92128, Telephone: 858-558-1800, Fax: (858) 558-1881
- C. Epoxy Cement Subcontractor Qualifications: Installer having experience with the Epoxy Cement System, the Installer having experience with that system shall supply the product and work.
- D. As part of the bid submittal the General Contractor shall submit background information/qualifications on his Epoxy Cement Contractor. This information shall provide evidence to indicate successful experience in providing epoxy cement work identical to that specified herein. A listing of projects shall be provided and shall be approved by Owner's Representative prior to award of bid. Failure to provide this information or the submittal of incomplete or inaccurate information shall give cause to reject the entire bid as non responsive and incomplete. The submittal shall provide the Owner's Representative with evidence of successful experience with the Epoxy Cement System and can demonstrate successful experience through past project documentation and references.
- E. Demonstration of experience: Provide a minimum of two (2) projects of installed Epoxy Cement System with a reference list of each containing address of installation, contact person and phone number of project's architect or owner's representation. Minimum size of each installation shall be 800 sq feet. Total size of installations shall be at least 4,000 sq feet. Provide two (2) color photos, 8"x10" size, of each installation listed above representing the installation. Photo #1 shall show the approximate size of the installation. Photo #2 shall be taken approximately 2 to 3 feet from the paving surface. See submittals portion of this section for additional information.

- F. Personnel Qualifications: Engage experienced personnel who have completed in the last five (5) years at least two (2) completed installations using this application material, design, and extent to that indicated for this project, of which one will serve as Lead Mechanic.

1.04 SUBMITTALS

- A. Product Data: Submit product data for all related materials including matrix, crack suppression membrane, divider strips, expansion strips, sealers, and cleaners.
- B. Samples
 - 1. Submit (3) 4" x 12" samples for each color and type specified or selected/
 - 2. Submit (3) 6" lengths of each divider of expansion strip required.
- C. Submit evidence of Installer qualifications for experience, demonstration of square footage installed, number of projects, and contact information to verify experience; evidence of personnel experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery of materials: Deliver products in a manner to prevent damage or contamination to containers or bags of materials.
- B. Storage and Protection: Comply with installer's recommendations.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Maintain ambient temperature and floor temperature at 50 degrees Fahrenheit or above for a period extending 72 hours before, during and after installation.
- B. Acceptable Substrates:
 - 1. Concrete sub-floor level tolerance shall be 1/4" in 10 feet. Any irregularity of the surface, which requires repair shall be performed with epoxy fillers and aggregates.
 - 2. Concrete substrate shall be tested to verify acceptable moisture levels prior to installation. Testing should be conducted in accordance with ASTM F2170 or by calcium chloride test.

1.07 WARRANTY

- A. Industry Standard 1 year from substantial completion date.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Primer: Epoxy Cement 100% Solids Epoxy Primer
- B. Flexible Membrane: 100% Solids Epoxy Crack Suppression Membrane
- C. Epoxy Cement: Epoxy Cement Matrix, 100% solids, -0- VOC Epoxy.
- D. Aggregates: Standard color aggregates or glass chips.
- E. Divider Strips: Zinc, Brass, or Aluminum, 1/8" in thickness unless noted otherwise on drawings.
- F. Cleaning, Sealing, and Finishing Materials: As recommended by installer.
- G. Moisture Transmission Barrier shall be as supplied or recommended by epoxy cement installer.

2.02 MIXES

- A. Selection:
 - 1. Type shall be 3/8" Epoxy Cement.
 - 2. Color mixes are custom to match samples #(s): #25-020a-sd, 25-020b-sd
- B. Proportions: Comply with epoxy cement installer's recommendations.
- C. Mixing: Change mixer and mix aggregates and epoxy in compliance with epoxy cement recommendations per formulations of approved samples.

PART 3 – EXECUTION

3.01 INSPECTION: EXAMINE AREAS TO RECEIVE EPOXY MATRIX FOR:

1. Defects in existing work that affect proper execution of the Epoxy Cement System work. Notify contractor of any defects in concrete sub-floor or other related work for correction.
2. Concrete shall be a minimum of 3,000 psi compressive strength and a minimum of 300 psi tensile strength, with 30-day cure, and shall be level to within ¼ per 10 lineal feet. Concrete slab shall have effective moisture barrier and moisture tests should be conducted to confirm suitability for installation of the Epoxy Cement flooring system.
3. Conduct moisture tests for concrete slabs on grade in accordance with ASTM F2170 or calcium chloride test. Report results for certification that moisture level are acceptable for installation of Epoxy Cement system. Reading of less than 20 pounds psf are acceptable for use of moisture Vapor Transmission Barrier. Readings of less than 3 pounds psf may allow for deletion of Moisture Vapor Transmission Barrier.
4. Inspect slab for visible cracks, if total length of cracks is less than the sq. ft. of the total, membrane system may be deleted and all cracks shall be bandaged per installer's recommendation.
5. Start only when all defects have been corrected by others and moisture test results have been certified as acceptable if installation is slab on grade.

3.02 INSTALLATION

- A. Subfloor:
 1. Prepare substrate to receive epoxy cement by shot blasting to expose clean concrete substrate
 2. If required due to moisture vapor transmission rate test results exceeding recommended levels, install moisture vapor transmission barrier to concrete slab per installer's recommendations.
 3. Where required, install membrane as required at cold joints and crack isolation membrane over concrete substrate.
 4. Install divider strips as indicated on approved layout. Place any expansion joint strips where required.
- B. Epoxy Cement System Installation:
 1. Prime subfloor in accordance with installer's recommendations.
 2. Place epoxy cement mixture in accordance with installer's recommendations.
- C. Curing: After completion of installation, cure in accordance with installer's recommendations.
- D. Cleaning and Sealing
 1. Apply sealer in accordance with installer's directions.
- E. Protection
 1. The General Contractor shall protect the finished floor at the time that the Epoxy Cement System is completed after sealer has dried sufficiently.

REQUIRED EPOXY SYSTEM SUB-CONSULTANT INFORMATION

The proper installation of specialty finishes such as the Epoxy Cement System is critical to the success of the project. The bidder, or the bidder's subcontractor, shall have three (3) or more Epoxy Cement System projects installed. Total size of installations shall be at least 4,000 sq feet. Additionally, the bidder must demonstrate experience with a minimum of two (2) projects featuring blended/seamless transitions in the Epoxy Cement System flooring.

EPOXY SYSTEM INSTALLER

- A. Contractor: _____
- B. Project Manager/Foreman: _____
- C. Phone Number: _____
- D. COMPARABLE PROJECT LIST (PROVIDE MINIMUM OF 3)

Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____

Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____

Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____

Provide two (2) color photos, 8"x10" in size, of each installation listed above. Photo #1 shall show the approximate size of the installation. Photo #2 shall be taken approximately 2 to 3 feet from the respective paving surface. Photos shall clearly show the detail associated with the Epoxy Cement finish or the photo(s) will be rejected. The bidder must submit the above information along with the color photos with the bid. Failure to submit the information and photos shall be considered a non-responsive bid and therefore the bidder shall be considered non-responsive. The bidder furthermore shall review the specialty concrete samples on file with the Owner. The signature below acknowledges that the bidder has reviewed the Owner's samples.

SIGNATURE OF BIDDER

DATE

END OF SECTION

**SECTION 09 51 00
ACOUSTICAL CEILINGS**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Suspension system for lay-in acoustical ceiling panels.
- B. Lay-in acoustical ceiling panels.

1.03 RELATED SECTIONS

- A. Section 26 51 19 – LED Interior Lighting.

1.04 REFERENCE STANDARDS

- A. Regulatory Requirements: Comply with applicable provisions of the following codes and standards, unless modified by the specifications or drawings.
 - 1. California Building Code.
 - 2. ASTM C 635 - Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - 3. ASTM C 636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Paneling.

1.05 SUBMITTALS

- A. Submit shop drawings indicating grid layout, related dimensioning, junctions with other work or ceiling finishes, and interrelation of mechanical and electrical systems.
 - 1. Reproduction of contract drawings as the basis of shop drawings for the work of this section is not acceptable.
 - 2. Field check existing walls and ceiling conditions before making layout so that shop drawings reflect the existing conditions.
- B. Submit product data, specifications, and manufacturer's installation instructions.
- C. Submit samples as follows:
 - 1. 12-inch long samples of main tees, cross tees and perimeter molding.
 - 2. Full sized samples of each type acoustical board and tile used in the work.
- D. Extra Stock: Provide Owner with an additional five percent of each type of acoustic panel and tile and ceiling grid in unbroken packages for use in repairs or replacements.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated and overhead mechanical work is completed, tested and approved.
- B. Permit wet work to dry prior to commencement of installation.
- C. Maintain uniform temperatures of minimum (60°C) and humidity of 20 percent to 40 percent prior to, during and after installation.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Suspension System:
 - 1. Manufacturers: Armstrong Ceilings, Donn Products, or equal, conforming to ASTM C 635, heavy duty system, sized to fit specified tile.

2. Grid: Non-fire rated exposed T, all components die cut and interlocking, Armstrong "Prelude XL" 15/16" Exposed Tee System, to be compatible with specified ceiling tile, or equal.
 3. Accessories: Stabilizer bars, furring clips, splices, and edge moldings as required to complete and complement suspended ceiling grid system.
 4. Materials/Finish: Commercial quality cold rolled steel with galvanized coating; white baked-on vinyl finish on exposed surfaces.
 5. Carrying Channels and Hangers: Galvanized steel; size and type to suit application and to rigidly secure the complete acoustic unit ceiling system, with maximum deflection of 1/360.
- B. Lay-In Acoustical Panels: 24" x 24" x 3/4", 15/16" beveled tegular, by Armstrong World Industries, or equal.
1. Basis of Design: Armstrong Ultima, #1951, Class A, NRC .60, CAC 40.
 2. Color shall be as indicated on Finish Schedule.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install acoustical ceiling systems in accordance with UBC Standard 47-18 and ASTM C 363 to produce finished ceiling true to lines and levels and free from warped, soiled or damaged grid or lay-in panels.
- B. Provide all necessary bracing to comply with requirements for lateral resistance.
- C. Install ceiling systems in a manner capable of supporting all superimposed loads, with maximum permissible deflection of 1/360 of span and maximum surface deviation of 1/8 inch in 10 feet.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work. Ensure the layout of hangers and carrying channels are located to accommodate fittings and units of equipment which are to be placed after the installation of ceiling grid systems.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest adjacent hangers and related carrying channels as required to span the required distance.
- F. Supply hangers or inserts for installation to the respective section in ample time and with clear instructions for their correct placement. Provide additional hangers and inserts as required.
- G. Hang independently of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of the longitudinal axis or face plane of adjacent members.
- H. Center ceiling systems on room axis leaving equal border pieces.
- I. Do not support fixtures from or on main runners or cross runners if weight of the fixture causes the total dead load to exceed the deflection capability. In such cases, support fixture loads by supplementary hangers located within 6 inches of each corner, or support the fixtures independently.
- J. Do not install fixtures so that main runners and cross runners will be eccentrically loaded. Where fixture installation would produce rotation of runners, provide stabilizer bars.
- K. Install edge moldings at intersection of ceiling and vertical surfaces, using maximum lengths, straight, true to line and level. Miter corners. Provide edge moldings at junctions with other ceiling finishes.
- L. Fit acoustic lay-in panels in place, free from damaged edges or other defects detrimental to appearance and function. Fit border units neatly against abutting surfaces.
- M. Install lay-in panels level, in uniform plane and free from twist, warp and dents.

3.02 ADJUSTMENTS AND CLEANING

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
ACOUSTICAL CEILINGS
09 51 00 -2

- A. Adjust any sags or twists which develop in the ceiling systems and replace any part which is damaged or faulty.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 09 51 26
WOOD VENEERED GRILLE PANELS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Wood grille ceiling panels.
 - 2. Installation system.

1.02 RELATED SECTIONS

- A. Section 09 24 00 – Cement Plastering.
- B. Section 09 29 00 – Gypsum Board.
- C. Division 23 Sections - HVAC.
- D. Division 26 Sections - Electrical.

1.03 REFERENCE STANDARDS

- A. California Air Resources Board (CARB) compliant
- B. Hardwood Plywood & Veneer Association (HPVA)
- C. ASHRAE Std 62.1 - 2004 Ventilation for Acceptable Indoor Air Quality
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- E. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- H. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. Shop Drawings: Layout and details. Show locations of items that are to be coordinated with or supported by the walls.
- B. Installation Instructions: Submit manufacturer's installation instructions as referenced in Part three, Installation.
- C. Product Data: Submit manufacturer's technical data for each type of ceiling unit and framing structure required.
- D. Samples: 4-1/4"x 7"x 3/4 – Real Wood Veneer on fire rated particle board - Semi-gloss tinted topcoat – Clear Finish
- E. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
- F. Substitutions: Under the provisions of Section 01 25 00 - Substitution Procedures:
 - 1. Submit proposed product substitutions no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review and acceptance. Approved products will be set forth by the Addenda. If a substitution is included in a Bid and is not approved by an Addendum, the

specified products shall be provided as in place of the substitute without additional compensation.

2. Submittals, which do not provide adequate data for the product evaluation, will not be considered. The proposed substitution must meet all requirements of this section, including but not limited to, the following: Single source materials suppliers, panel design, size, composition, color, and finish; suspension system component profiles and sizes; compliance with the referenced standards.
- G. Non-Conformance: All products not conforming to the requirements of this specification and or the manufacturer's published values are to be disposed. The Contractor performing the work will replace with approved product at their expense.

1.05 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide ceiling panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify ceiling components with appropriate markings of applicable testing and inspecting organization.
 1. Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with ASTM E1264 for Class B products.
 2. HPVA (Hardwood Plywood and Veneer Association) certification and audit program per ASTM E84 tunnel test.
- C. Woodworking Standards: Manufacturer must comply with specified provisions of Architectural Woodworking Institute quality standards.
- D. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store ceiling components in a dry interior location in their cartons prior to installation to avoid damage. Store cartons in a flat, horizontal position. The protectors between the panels should not be removed until installation.
- B. Do not store in unconditioned spaces with humidity greater than 55 percent or lower than 25 percent relative humidity and temperatures lower than 50 degrees Fahrenheit or greater than 86 degrees Fahrenheit. Panels must not be exposed to extreme temperatures, for example, close to a heating source or near a window with direct sunlight.
- C. Handle ceiling units carefully to avoid chipped edges or damage to units in any way.

1.07 PROJECT CONDITIONS

- A. Wood ceiling materials should be permitted to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation. (Remove plastic wrap to allow panels to climatize).
- B. The wood panels should not be installed in spaces where the temperature or humidity conditions vary from the temperatures and conditions that will be normal in the occupied space.
- C. As interior finish products, the Veneered wood panels are designed for installation in temperature conditions between 50 degrees Fahrenheit and 86 degrees Fahrenheit, in spaces where the building is enclosed, and HVAC systems are functioning and will be in continuous operation. Relative humidity should not fall below 25 percent or exceed 55 percent.

1.08 WARRANTY

- A. ACGI WW Grille Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period.
 1. Failures include, but are not limited to defects in materials or factory workmanship.
- B. Warranty Period: One (1) year from date of installation.

- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.09 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
1. Wall Units: Furnish quality of full-size units equal to two (2) percent of amount installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design ACGI WoodWorks Grille Veneered Walls Panels by Armstrong Global, or approved equal. Contact Dai-Nee Tan : dtan@armstrongceilings.com
1. WoodWorks Grille - Forté Veneered Panels. Armstrong
 2. Centered Notched and Flat Backers, wire hangers, fasteners, main runners, cross tees, ceiling angle moldings and accessories.

2.02 WOOD CEILING UNITS

- A. Ceiling Panels, Type ACT-10:
1. Surface Texture: Smooth
 2. Composition: Real wood veneer on fire rated particle board
 3. Finish(s): Real Wood Veneer
 - a. Rift White Oak (NRO) with custom painted Backer color # 6237 Dark Knight
 4. Panel Width: 12-inch
 - a. Panel Length Size(s): With 1" reveal panel to panel @ length
 - b. 48-inch (Nominal): 47-inch (Actual)
 - c. 72-inch (Nominal): 71-inch (Actual)
 - d. 96-inch (Nominal): 95-inch (Actual)
 5. Panel Length Size(s): 48-inch, 72-inch, 96-inch (Nominal): 47-inch, 71-inch, 95-inch (Actual) With 1" reveal panel to panel @ length
 - a. Slat Width 3/4-inch , Slat height 1.5" , Spacing 6 blades per linear feet
 6. WoodWorks Edgebanding – item 6408 NRO for field cut edges.
 7. Flame Spread:
 - a. Class A: ASTM E84 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less.
 - b. CAN/ULC S102 surface burning characteristics. Flame Spread Rating 25 or less. Smoke Developed Classification 50 or less.
 8. Acceptable Product: Armstrong ACGI WoodWorks Grille-Veneered Panels – Item GB1-61500-C as manufactured by Armstrong World Industries.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out.
- B. Proper designs for both supply air and return air, maintenance of the HVAC filters and building interior space are essential to minimize soiling. Before starting the HVAC system, make sure supply air is properly filtered and the building interior is free of construction dust.

3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with ceiling elevations. Coordinate panel layout with mechanical and electrical fixtures.

- B. WoodWorks ceiling materials should be permitted to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation. (Remove plastic wrap to allow panels to climatize).

3.03 INSTALLATION

- A. Interior WoodWorks products, the veneered wood panels are designed for installation in temperature conditions between 50 degrees Fahrenheit and 86 degrees Fahrenheit, in spaces where the building is enclosed, and HVAC systems are functioning and will be in continuous operation. Relative humidity should not fall below 25 percent or exceed 55 percent.

3.04 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of ceiling panels, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.

END OF SECTION

**SECTION 09 65 00
RESILIENT FLOORING**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Rubber Base.
- B. Resilient Tile Flooring.
- C. Rubber Mat Floor and Base.
- D. Rubber Stair Treads.
- E. Resilient Flooring Accessories.

1.02 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification Sections, apply to this Section.
- B. Section 03 30 00 Cast-in-Place Concrete.
- C. Section 09 21 16 Gypsum Board Assemblies

1.03 REFERENCE STANDARDS

- A. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s); 2025.

1.04 QUALITY ASSURANCE

- A. The VOC content of adhesives and sealants used must be less than the current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1113.

1.05 SUBMITTALS

- A. Materials List: Submit complete list of all materials included in this Section and any required materials not listed.
- B. Samples: Submit 8" x 10" minimum of each item and color available in the specified products from the proposed manufacturer.
- C. Shop Drawings: Submit shop drawings indicating tile layout, related dimensioning.
 - 1. Reproduction of contract drawings as the basis of shop drawings for the work of this section is not acceptable.
 - 2. Field check existing walls conditions before making layout so that shop drawings reflect the existing conditions.
- D. Extra Stock: Provide Owner with an additional five percent (5%) of each type and lot number of specified product in unopened packages for use in repairs or replacements. The cost of this material shall be included in the Contractor's bid or the contract price.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Deliver materials to the job site and store in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturers' recommendations.
- B. Protection: Use all means necessary to protect materials of this Section before, during and after installation and to protect installed work and materials of all other trades.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide rubber wall base manufactured by Johnsonite (Tarkett USA), or equal.
 - 1. Rubber Base for Standard Application: Topset (standard cove) 4-inch-high rubber base.

2. Color: As indicated on drawings.

2.02 RESILIENT FLOORING ACCESSORIES

- A. Adhesives: As recommended by manufacturer which comply with the VOC limits noted above.
- B. Edging Strips/Transitions: Rubber transition strips coordinating adjacent flooring finishes. Color as selected by Architect from manufacturer's full range of standard colors.

2.03 RESILIENT TILE FLOORING

- A. Manufacturers: Subject to compliance with requirements, provide luxury vinyl tile manufactured by Tarkett/Johnsonite, or equal.
 1. Vinyl composition tile shall conform to the requirements of ASTM F1700 Standard Specification for Solid Vinyl Floor Tile, Class III, Type B.
 2. Color: As indicated on drawings.

2.04 RUBBER MAT FLOORING

- A. Manufacturers: Subject to compliance with requirements, provide "Triumph" rubber mat flooring and wall base as manufactured by Johnsonite / Tarkett, or equal.
 1. Prefabricated athletic rubber flooring, calendared and vulcanized with a base of natural and synthetic rubber, stabilizing agents, and pigmentation.
 2. Color: As indicated on drawings.
 3. Thickness: 3/8 inch.
 4. Tile Size: 24x24
 5. Finish: Hammered Texture.
 6. Connection: Slidelock

2.05 RUBBER STAIR TREADS

- A. Manufacturers: Subject to compliance with requirements, provide "AngelFit" rubber stair treads with integrated riser, as manufactured by Johnsonite / Tarkett, or equal.
 1. Tread/Riser for Visually Impaired (VIRNSQTR).
 2. Color: As indicated on drawings.
 3. Finish: "Raised Square".

2.06 RESILIENT FLOORING ACCESSORIES

- A. Floor Patching Compound/Underlayment: Latex type as recommended by the flooring manufacturer.
- B. Crack Filler: For concrete floor surfaces use non-shrinking cement mortar as recommended by flooring manufacturer
- C. Moisture Sealer: As recommended by manufacturers of flooring materials and selected by Installer to meet project circumstance and requirements where moisture content exceeds manufacturer's allowable limits.
 1. Sealer must comply with VOC limits noted above.

2.07 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be as recommended by the manufacturer of the resilient materials used.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which resilient flooring is to be placed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Surface shall be smooth, level, at the required finish elevation, without more than 1/8-inch in 10-foot variation from level or slopes shown.

- C. Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level prior to installation of Resilient Tile Flooring. All test results shall be documented and retained.
- D. Prepare subfloors to receive Resilient Tile Flooring per flooring manufacturer's recommendations.
- E. Substrate to be free of all dust, loose particles, solvents, paint, grease, oil, wax, alkali, sealing/curing and parting compounds, old adhesive, and any other foreign material, which could affect the installation and adhesive bond to the substrate. All substrate contaminants must be mechanically removed prior to the installation of the flooring.

3.02 RUBBER BASE INSTALLATION

- A. Fit joints tight and vertical. Maintain minimum measurement of 18-inches between joints.
- B. Miter internal corners. Use pre-molded sections for external corners and exposed ends.
- C. Install base on solid backing. Adhere tightly to wall and floor surface.
- D. Scribe and fit to door frames and other obstructions.
- E. Install straight and level to variation of plus or minus 1/8-inch over 10-feet (1/960).
- F. No gaping of material will be permitted. Base must be completely adhered to wall material.

3.03 RESILIENT TILE FLOORING INSTALLATION

- A. Install flooring in strict accordance with the latest flooring manufacturers' recommendations. Failure to comply may result in voiding the manufacturer's warranty.
- B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
- D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- E. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.04 RUBBER MAT INSTALLATION

- A. Clean substrate. Spread two-part epoxy adhesive evenly in quantity recommended by manufacturer to ensure adhesion over entire area. Spread only enough adhesive to permit installation of flooring before initial set.
- B. Set flooring in place per manufacturer's recommendations, press with heavy roller to ensure full adhesion.
- C. Hold all seams in place with suitable weights (concrete utility bricks 2 x 4 x 8) for a minimum of 12 hrs.
- D. Lay flooring with joints and seams parallel to building lines.
- E. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
- F. Install edge strips at unprotected or exposed edges where flooring terminates and as dictated.
- G. Scribe flooring to walls, columns, cabinets, floor outlets and other appurtenances to produce tight joints.
- H. Install material for wall installation in similar manner and as recommended by the manufacturer.

3.05 STAIR TREAD INSTALLATION

- A. Minimum substrate temperature must be 60°F (15.6°C) and must be within 5°F (2.8°C) of ambient temperature. Substrate temperature must be a minimum of 10°F (5.6°C) higher than the dew point temperature
 - B. Follow all Manufacturer's installation requirements.
 - 1. The installation of new stairwell materials should not be performed until all the other trades have completed their work. Proper precautions must be taken during and after the installation process to avoid damage to the newly installed stairwell materials.
 - 2. Because each step on a staircase can vary slightly in width, depth, and squareness, Manufacturer recommends scribing each tread and riser to ensure proper fit on the step.
 - 3. If the tread has Grit Tape or Photo Luminescent strips, cut strips back 1/16" on each side of tread to allow for expansion. After installation of the tread, roll the Grit Tape or Photo Luminescent strips to ensure adhesion.
 - C. Trimming may be required to obtain proper fit on each stair. In cases where the staircase is the same width as Stair Treads with integrated Risers, order the next size up to allow for proper installation.
 - 1. Trimming on both sides of the tread may be required to obtain proper fit and pattern match to adjacent steps.
 - 2. Wide staircases, which require butting multiple lengths of product, will require additional planning and dry fitting prior to adhesive
- 3.06 CLEANING AND PROTECTION
- A. Remove excess adhesive or other surface blemishes from flooring, using neutral type cleaners recommended by the flooring manufacturer. Protect installed flooring from damage until acceptance by the Owner.
- 3.07 FINISHING
- A. After completion of the Work and just prior to final inspection, thoroughly clean resilient flooring, wall base, and accessories.

END OF SECTION

**SECTION 09 68 00
CARPETING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile.
- B. Custom Broadloom Carpet.

1.02 RELATED REQUIREMENTS

- A. Section 01 35 10 Sustainability (CALGreen) Requirements.
- B. Section 01 74 19 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap, removed carpet tile, carpet cushion and carpet remnants.
- C. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.
- D. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- G. CRI 104 - Standard for Installation of Commercial Carpet; 2015.
- H. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements. Submit, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate coordination for layout of joints and direction of carpet pile.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Sustainable Design Submittal: Submit VOC content documentation for adhesives.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports prior to installation and comply with Manufacturer's requirements.
- H. Manufacturer's Qualification Statement.
- I. Installer's Qualification Statement.

- J. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Carpet: Quantity equal to 5 percent of total installed of each color and pattern installed.
- L. Seaming Diagram: Provide seaming plan for Broadloom carpet for Interior Designer to approve prior to ordering carpet.
 - 1. Seaming intended to reduce traffic wear and tear across seams.
 - 2. Broadloom carpet requires pattern matching across seams.

1.05 QUALITY ASSURANCE

- A. Carpet manufacturer shall have been manufacturing commercial and/or contract carpet tile continuously for a period of 10 years.
- B. Qualifications of Installers: All work shall be done by installation firms specializing in commercial carpet installation. It is recommended that, whenever possible, the firm shall be a member of the Floor Covering Installation Contractors Association (FCICA) or certified by the Floor Covering Installation Board (FCIB).
- C. Carpet manufacturer shall certify by register and roll numbers or M.O.# that carpet shipped for this project complies with all requirements of this Section subject to normal manufacturing tolerances.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Carpeting shall be delivered to the job site in original mill wrapping with each roll or tile box having its register number properly attached, clearly marked as to size, dye lot, and materials.
- B. Material shall be stored in an enclosed and dry area protected from damage and soiling.
- C. Coordinate location or storage area within building with the General Contractor.
- D. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.07 FIELD CONDITIONS

- A. Floor covering installation contractor shall visit the site and be responsible for all measurements and job conditions.
- B. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.
- C. Do not begin carpet installation until painting and finishing work are complete and ceilings and overhead work have been tested, approved, and completed.
- D. Maintain room temperature at 65°F (18°C) minimum for at least 48 hours prior to installation and relative humidity at 65% maximum.
- E. After installation, continue to fresh-air ventilate for 48 to 72 hours at normal room temperatures by operating the ventilation fan system at full capacity and by opening windows and doors, if possible.

1.08 WARRANTY

- A. Manufacturer's Warranty: Carpet shall carry a 15 year Manufacturer's Warranty. See written warranty document for details.
- B. Floor Covering Installation Contractor's Warranty: Submit a certificate guaranteeing the installation to be free of defects in workmanship for a period of one year. The certificate shall include the following statement: Installer shall, at his own expense and upon written notice from the Owner or his representative, promptly correct/replace any and all improper work and material that may become apparent within one year after the date of final completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carpeting: Basis of Design
 - 1. Shaw Contract: www.shawcontract.com
 - 2. Substitutions: See Section 01 25 00 - Substitution Procedures

2.02 PRODUCT: CARPET TILES, LOCAL LANDSCAPES - MIGRATE, BY SHAW CONTRACT.

- A. Pattern: Style 5T606.
- B. Tile carpeting, manufactured in one color dye lot.
- C. Construction: Multi-Level Patterned Loop.
- D. Tile Size: 18" by 36".
- E. Thickness: 0.297".
- F. Total Weight: 22 oz/sq yd.
- G. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 1. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 - 2. VOC Content: Comply with Section 01 35 10.
- H. Density: 6140 oz/yd.
- I. Primary Backing Material: Synthetic.
- J. Secondary Backing Material: Ecworx®
- K. Use only approved adhesives.

2.03 PRODUCT: CUSTOM BROADLOOM CARPET, TRYK, BY SHAW CONTRACT.

- A. Pattern Style: #F1327718, RR96786CRI
- B. Tile carpeting, manufactured in one color dye lot.
- C. Construction: Cut and Loop
- D. Size: 15'
- E. Fiber: Ecosolution Q® Nylon, 100% Solution Dyed
- F. Total Thickness: 0.362 inch.
- G. Tufted Weight: 38 oz/yd².
- H. Primary Backing: Synthetic.
- I. Secondary Backing Ultraloc®.
- J. Use only approved adhesives.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.

2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Custom broadloom carpet has a pattern repeat and must be installed according to the manufacturer's instructions
- D. Custom broadloom carpet has a pattern repeat and must be installed according to the manufacturer's instructions.
 1. Seaming diagram must be approved by the Interior Designer and Architect prior to ordering the carpet.
- E. Blend carpet tiles from different cartons to ensure minimal variation in color match.
- F. Cut carpet tile clean. Fit carpet tight to intersection with horizontal and vertical surfaces without gaps.
- G. Lay carpet tile in square pattern, with pile direction parallel to next unit, set as approved in the shop drawings.
- H. Lay broadloom carpet according to approved seaming diagram.
- I. Locate change of color or pattern between rooms under door centerline.
- J. Fully adhere carpet to substrate.
- K. Trim carpet tile neatly at walls and around interruptions.
- L. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

**SECTION 09 72 00
WALL COVERINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation and prime painting.
- B. Wall covering.

1.02 RELATED REQUIREMENTS

- A. Section 01 35 10 - Sustainability (CAL Green) Requirements; VOC content of primer/paint.

1.03 REFERENCE STANDARDS

- A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Shop Drawings: Indicate wall elevations to receive wallcoverings. Show seaming layout.
- D. Samples: Submit two samples of wall covering, 8.5" by 11" or showing a full pattern repeat, illustrating color, finish, and texture.
- E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.
- H. Manufacturer's Qualification Statement.
- I. Installer's Qualification Statement.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
 - 3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Provide panel, three panel drops wide, full height, illustrating installed wall covering and joint seaming technique.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.

- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.01 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
 - 2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.
- B. Wall Covering: Per the Finish Schedule in the drawings.
 - 1. Color: Per the Finish Schedule in the drawings.
- C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- E. Substrate Primer and Sealer: As recommended by manufacturer of wallcovering, and compatible with adhesive..

PART 3 EXECUTION

3.01 EXAMINATION

- A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- B. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

- A. Fill cracks and defects in substrate and smooth irregularities with filler; sand smooth.
- B. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- C. Surfaces: Clean surfaces. Remove existing coatings that exhibit loose surface defects.
- D. Marks: Seal with shellac those that may bleed through surface finishes.
- E. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- F. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- C. Overlap or butt edges of adjacent panels tightly, as recommended by manufacturer. Remove any excess adhesive immediately to prevent staining.
- D. Horizontal seams are not acceptable.
- E. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

- F. Install wall covering before installation of cabinets and items attached to or spaced slightly from wall surface.
 - 1. Protect wallcovering when installing all items over wallcovering. Replace any damaged wallcovering.
- G. Do not install wall covering more than 1/4 inch below top of resilient base.
- H. Cover spaces above and below windows, above doors, in pattern sequence from roll.
- I. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

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SECTION 09 78 13
INTERIOR METAL WALL PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal wall paneling.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 29 00 Gypsum Board

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's descriptive literature for each specified product. Include anchorage devices specific to project substrate types.
- C. Shop Drawings: Submit elevations for each application and location. Indicate details of joints and attachments.
 - 1. Scale of Drawing Elevations: 1/4 inch to 1 foot, minimum.
 - 2. Scale of Drawing Details: 1-1/2 inches to 1 foot, minimum.
- D. Samples: Submit two samples 12 by 12 inches in size, indicating finish, surface design, and color for each type of panel.
- E. Manufacturer's Instructions: Provide manufacturer's installation instructions.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Maintenance Data: Include recommended instructions, methods, and materials for cleaning.
- I. Specimen Warranty: Manufacturer warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.
- B. Installer Qualifications: Company specializing in installing work of the type specified in this section, and with at least three years of documented experience.

1.05 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Construct one mock-up, 12 feet long by 4 feet wide of wall paneling of each type, illustrating joints and trim.
- C. Locate where directed.
- D. Mock-ups may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging, marked with manufacturer's product identification.
- B. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Correction Period: Correct defective work within a 1-year period commencing on the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Interior Wall Paneling:
1. Protek Systems, Incorporated, 1250 Wallace Dr. Unit B, Delray Beach, FL 33444; Telephone: 800-598-2153, Fax: 561-395-4771, www.proteksystem.com
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL INTERIOR WALL PANELING

- A. Metal Wall Panel System:
1. Applications: Wall cladding.
 2. Panel Size: 4 feet by 4 feet feet.
 3. Thickness: 0.035 inch.
 4. Finish: As selected by Architect from manufacturers standard line.
- B. Materials:
1. Type 304 mill finish stainless steel diamond plate
 2. Thickness: As recommended by manufacturer (1/8-inch minimum)
 3. Height: As specified on drawings. 48-inch, 96-inch, and 120-inch standard heights.
 4. Construction: Butt seam joints. Provide inside corners, outside corners, and edge trim as required.
 5. Finish: Mill finish
 6. Installation: Adhesive or mechanical fasteners
 - a. Adhesive: Type recommended by panel manufacturer.
 7. Fabrication: Shop fabricate to greatest extent possible.
 - a. Pre-drilled panels available. Contractor to coordinate.
- C. Components
1. WPSD-12 Stainless Steel Diamond Plate Wall Panel
 - a. Material: Type 304 mill finish stainless steel diamond plate
 - b. Size: As specified on drawings. 48-inch x 96-inch and 48-inch x 120-inch standard sheet sizes.
 - c. Flat wall panel
 2. WPSD-12-ICG-50 Inside Corner
 - a. Material: Type 304 mill finish stainless steel diamond plate
 - b. Height: As specified on drawings. Same height as wall panels typical.
 - c. Wing Dimension: 2-inch
 - d. Inside corner trim that mounts over wall panels
 3. WPSD-12-OCG-50 Outside Corner
 - a. Material: Type 304 mill finish stainless steel diamond plate
 - b. Height: As specified on drawings. Same height as wall panels typical.
 - c. Wing Dimension: 3 1/2-inch
 - d. Outside corner trim that mounts over wall panel.
 4. EB-1 High-Impact Top Cap
 - a. Material: Flexible vinyl bumper with continuous aluminum mounting retainer.
 - b. Profile: 1-inch depth x 1-inch height
 - c. Installation: Supplied in standard lengths and cut to fit in the field. 144-inch standard lengths. Provide end caps and outside corners as required.
 - d. Edge trim. Typically used on top edge only.
 5. Adhesive: Type recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces for adhered items are flat, clean and smooth.
 - 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer.
- B. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install panels in accordance with manufacturer's instructions.
- B. Apply adhesive to back side of panel using trowel recommended by adhesive manufacturer.
- C. Apply panels to wall with vertical joints plumb and horizontal joints level and pattern aligned with adjoining panels.
- D. Install panels with manufacturer's recommended gaps for panel field and corner joints.
- E. Install trim with adhesive.
- F. Seal joints at wall base and between panels with approved sealant to prevent moisture intrusion.
- G. Remove excess sealant after paneling is installed and prior to curing.

3.03 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean panel faces using cleaning agents and methods recommended by manufacturer to remove soiling.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals for closeout submittals.

3.05 PROTECTION

- A. Protect installed interior wall paneling from subsequent construction operations.

END OF SECTION

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**SECTION 09 91 00
PAINTING**

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

- A. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

1.02 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification Sections, apply to this Section.

1.03 SECTION INCLUDES

1. Extent of painting work is indicated on drawings and schedules, and as herein specified.
2. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.
3. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
4. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
5. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
6. Surfaces to be painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.
7. Following categories of work are not included as part of field-applied finish work.
 - a. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items.
 - b. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, pipe spaces, and shafts.
 - c. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 - d. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor, and fan shafts will not require finish painting.
8. Following categories of work are included under other sections of these specifications:
 - a. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrication, metal doors and frames, and similar items.
 - b. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these specifications.
9. Mechanical and Electrical Work: Painting of mechanical and electrical work is specified in Division 23 and 26, respectively.
 - a. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

B. QUALITY ASSURANCE

1. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer and use only within recommended limits.
2. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.04 SUBMITTALS

- A. Manufacturer's Data:
 1. Complete materials list of all items proposed to be furnished and installed under this Section.
 2. Manufacturers' specifications and other data required to demonstrate compliance with the specified requirements.
 3. For information only, submit two copies of manufacturer's specifications and application instructions for each material.
 4. The VOC content of interior paint materials used must be less than the current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168, AND all sealants used as fillers must meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51. Submit data indicating VOC content of each material proposed for use
- B. Samples: Following the selection of colors and glosses by the Architect, submit samples for the Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.
 1. Submit six draw-down samples of each paint color and gloss type indicated.
 - a. Stain samples shall be submitted on samples of actual wood type being used on project.

1.05 PRODUCT HANDLING

- A. Deliver all materials to the job site in original, new, and unopened containers bearing the manufacturer's name and label.
- B. Provide proper storage to prevent damage to, and deterioration of, paint materials.
- C. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.06 JOB CONDITIONS

- A. Surface Temperatures: Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperature are below 45 degrees Fahrenheit, unless otherwise permitted by the manufacturer's printed instructions.
- B. Weather Conditions: Do not apply paint in rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by the manufacturer's printed instructions. Applications may be continued during inclement weather within the temperature limits specified by the paint manufacturer during application and drying periods.

1.07 REGULATORY REQUIREMENTS

- A. Provide paint under the provisions of Section 01 35 10 - Sustainability (CALGreen) Requirements.
- B. All material and application of material shall comply with all air pollution control regulations.

1.08 EXTRA STOCK

- A. Amount: Upon completion of the work of this Section, deliver to the Owner an extra stock equaling 10% of each color, type, and gloss of paint used on the Work, but not more than five gallons for each.
- B. Packaging: Tightly seal each container and clearly label with the contents and location used.

1.09 GUARANTEE

- A. Guarantee the painting work, in writing, against peeling, fading, cracking, blistering, or crazing for a period of three years from the time the Notice of Completion is filed.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Principal paint materials, unless otherwise indicated, shall be as manufactured by Sherwin-Williams (Basis of Design),
 - 1. Dunn-Edwards Corp.,
 - 2. Vista Paint,
 - 3. or equal.
- B. Colors and Glosses: The Architect will select colors to be used in the various types of paint specified and indicated and will be the sole judge of acceptability of the various glosses obtained from the materials proposed to be used in the Work.
- C. Undercoats and Thinners: Provide undercoat paint produced by the same manufacturer as the finish coat. Use only the thinners recommended by the paint manufacturer and use only to the recommended limits. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

2.02 APPLICATION EQUIPMENT

- A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint.
- B. Compatibility: Prior to actual use of application equipment, use all means necessary to verify that the proposed equipment is actually compatible with the material to be applied and that the integrity of the finish will not be jeopardized by use of the proposed application equipment.

2.03 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new first-quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection: Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that painting may be completed in strict accordance with the original design and with the manufacturer's recommendations.
- B. Discrepancies: Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 MATERIALS PREPARATION

- A. Mix and prepare painting materials in strict accordance with the manufacturer's recommendations.
- B. Store materials not in actual use in tightly covered containers.
- C. Maintain containers used in storage, mixing, and application of paint in a clean condition, free from foreign materials and residue.

- D. Stirring: Stir all materials before application to produce a mixture of uniform density, and as required during the application of materials. Do not stir into the material any film which may form on the surface. Remove the film and, if necessary, strain the material before using.

3.03 SURFACE PREPARATION

- A. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's recommendations.
- B. Remove all removable items which are in place and are not scheduled to receive paint finish or provide surface-applied protection prior to surface preparation and painting operations.
- C. Following completion of painting in each space or area, reinstall the removed items by using workmen skilled in the necessary trades.
- D. Clean each surface to be painted prior to applying paint or surface treatment.
- E. Remove oil and grease with clean cloths and cleaning solvents of low toxicity and a flash point in excess of 100 degrees Fahrenheit prior to start of mechanical cleaning.
- F. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall onto wet newly painted surfaces.
- G. Preparation of Metal Surfaces:
 - 1. Thoroughly clean all surfaces until they are completely free from dirt, oil, and grease. Clean cutting oil from exposed pipes.
 - 2. On galvanized surfaces, use solvent for the initial cleaning and then treat the surface thoroughly with phosphoric acid etch. Remove all etching solution before proceeding.
 - 3. Allow to dry thoroughly before application of paint.
 - 4. Apply primer the same day pretreatment is applied.

3.04 PAINT APPLICATION

- A. On all removable panels and all hinged panels, paint the back sides to match the exposed sides.
- B. Apply one heavy coat of flat black paint on all construction visible through screen vents and grilles.
- C. Drying: Allow sufficient drying time between coats. Modify the period as recommended by the material manufacturer to suit adverse weather conditions.
- D. Brush and Roller Application: Apply all coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush or roller marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.
- E. Spray Application: Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of two coats in one pass.
- F. Backroll all sprayed surfaces to provide uniform finish appearance.
- G. Completed work shall match the approved Samples for color, texture, and coverage. Remove, refinish, or repaint all work not in compliance with specified requirements.

3.05 PAINTING SCHEDULE - EXTERIOR

- A. Ferrous Metal – Semi-Gloss:
 - 1. 1st Coat: Pro Industrial Pro-Cryl, Primer B66-310
 - 2. 2nd Coat: Pro Industrial Acrylic, B66-650
 - 3. 3rd Coat: Pro Industrial Acrylic, B66-650
- B. Non-Ferrous Metal – Semi-Gloss:
 - 1. Pretreatment: SSPC-SP 1
 - 2. 1st Coat: Pro Industrial Pro-Cryl, Primer B66-310
 - 3. 2nd Coat: Pro Industrial Acrylic, B66-650
 - 4. 3rd Coat: Pro Industrial Acrylic, B66-650

- C. Wood – Semi-Gloss:
 - 1. 1st Coat: Preprite ProBlock, Primer, B51 Series
 - 2. 2nd Coat: Pro Industrial Acrylic, B66-650
 - 3. 3rd Coat: Pro Industrial Acrylic, B66-650

3.06 PAINTING SCHEDULE – INTERIOR

- A. Gypsum Board – Eggshell:
 - 1. 1st Coat: ProMar 200 Zero VOC, Primer B28W2600
 - 2. 2nd Coat: ProMar 200 Zero VOC, Eggshell B20-2600
 - 3. 3rd Coat: ProMar 200 Zero VOC, Eggshell B20-2600
- B. Gypsum Board – Semi-Gloss:
 - 1. 1st Coat: Promar 200 Zero VOC, Primer B28W2600
 - 2. 2nd Coat: ProMar 200 Zero VOC, Semi-Gloss B31-2600
 - 3. 3rd Coat: ProMar 200 Zero VOC, Semi-Gloss B31-2600
- C. Gypsum Board – Flat:
 - 1. 1st Coat: Promar 200 Zero VOC, Primer B28W2600
 - 2. 2nd Coat: ProMar 200 Zero VOC, Flat B30-2600
 - 3. 3rd Coat: ProMar 200 Zero VOC, Flat B30-2600
- D. Galvanized Metal – Semi-Gloss:
 - 1. 1st Coat: Uniflex Rust Inhibitive Metal Primer, 34-520
 - 2. 2nd Coat: ProIndustrial Acrylic, B66-650
 - 3. 3rd Coat: ProIndustrial Acrylic, B66-650
- E. High Performance Epoxy/Polyurethane – Semi-Gloss:
 - 1. 1st Coat: Macropoxy 646-100, Fast Cure Epoxy - B58 Series
 - 2. 2nd Coat: ProIndustrial Water Based Epoxy, B65-520 Series
 - 3. 3rd Coat: ProIndustrial Water Based Epoxy, B65-520 Series
- F. Wood – Stain and Lacquer (Shop Finish):
 - 1. 1st Coat (Stain)herWood BAC Stain, S64 Series
 - 2. 2nd Coat (Sealer): KemAqua Sanding, Sealer T65F520
 - 3. 3rd and 4th Coats: KemAqua Lacquer, Satin, T75F527

END OF SECTION

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**SECTION 10 14 00
IDENTIFYING DEVICES**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Exterior parking and building signage.
- B. Interior building signage.
- C. Interior wall plaque.

1.03 SUBMITTALS

- A. Submit fully detailed shop drawings giving sizes, methods of attachment, and all required accessories.
- B. Submit product data for all products specified.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Manufacturers: Subject to compliance with requirements, provide custom fabricated identifying signage as manufactured by ASI Sign Systems, Bradford Signs, or equal.

2.02 IDENTIFYING DEVICES

- A. Disabled Parking Signs: Comply with Title 24, California Administrative Code, and as indicated. Signs shall be of steel with reflectorized porcelain finish, white lettering on blue background, and mounted on galvanized steel pipe supports or on building, as occurs.
- B. Toilet Room Accessibility Signs: Comply with Title 24, California Administrative Code and Americans with Disabilities Act (ADA) with raised and braille letters and as indicated. Provide room identification signage with tactile and braille, as well as door signage (12-inch equilateral Triangle for men, 12-inch diameter circle for women), 0.25-inch thick Plexiglas, adhesive applied. Symbols and lettering as indicated. Signage colors to be as indicated.
- C. Interior Room Identification Signs: Acrylic plastic signs with raised letters and braille, ASI Sign Systems, or equal.
 - 1. As indicated, mounted with double faced tape or adhesive as recommended by manufacturer. Mount 60-inch above finished floor on strike side of door, unless noted otherwise. Confirm location of all signs with Architect prior to installation.
 - 2. Colors shall be as indicated on drawings.
 - 3. Style of Lettering: Sans Serif, 1-inch high capitals, related lower case and numerals.
 - 4. Text of Signs: The text of signs is indicated on the door schedule and as confirmed with Architect.
- D. Exterior Room Identification Signage: As specified for interior room identification signage. Mounting to be with screws through face of sign. Screws to be finished to match sign color.
 - 1. Colors shall be as indicated on drawings.
 - 2. Style of Lettering: as indicated on drawings.
 - 3. Text of Signs: The text of signs is indicated on drawings and as confirmed with Architect.
- E. Wall Plaque: Fabricate of bronze to dimensions and text as indicated. Mounting shall be by concealed stainless steel studs. Background shall be leatherette textured, finished with satin polished natural color with clear lacquer final coat.
- F. Exterior Parking lot signage: See drawings for Fire Lane signage, One-way signage, and all other required parking lot signage.

- G. Enameled Exterior Signs: Safe Surrender Site, Smoking Prohibited
 - 1. Material: 0.063" thick baked white enamel, aluminum sign substrate.
 - 2. Design and Location: Per the drawings.
 - 3. Mounting: Stainless Steel tamper-proof screws into expansion anchors in stucco with silicone adhesive.
- H. Exterior Building Signage (Building Name and Address)
 - 1. Material: Illuminated Aluminum Reverse Channel Letters.
 - 2. Design and Location: Per the drawings.
 - 3. Mounting: 3/4" standoff support
- I. Exterior Entry Seal Signage:
 - 1. Material: 4mm thick Aluminum Composite Sheeting (i.e., Dibond or similar), a rigid sign substrate made of two sheets of .012 aluminum bonded to a thermoplastic core.
 - 2. Graphics: Digitally printed 1440 dpi in UV ink with clear anti-graffiti clear coat for added durability.
 - 3. Design and Location: Per the drawings.
 - 4. Mounting: Screws through face of sign into wall. Screws painted same color as sign background and set inside graphic around perimeter
- J. Storefront Glass Applied Decal Sign:
 - 1. Material: Single-sided, opaque vinyl, second surface glass applied decal sign
 - 2. Design and Location: Per the drawings.
 - 3. Mounting: Adhesive decal.

PART 3 – EXECUTION

IDENTIFICATION SIGNAGE INSTALLATION

- A. Install disabled parking signs on pipe supports as indicated.
- B. Install toilet room accessibility signs on door as indicated.
- C. Install interior room identification signage on wall adjacent to doors, mounting heights shall be 60-inches above finished floor, and as required by code.
- D. Install exterior building signage and wall plaque as indicated in the drawings and in accordance with manufacturer's recommendations.
- E. Install all signage and characters as indicated above and as noted on drawings.

END OF SECTION

**SECTION 10 28 13
TOILET ACCESSORIES**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Washroom accessories as scheduled in this Section and as indicated on the Drawings.

1.03 RELATED REQUIREMENTS

- A. Section 06 10 00 – Rough Carpentry.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets for each product specified, including the following:
 - 1. Installation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Cleaning and maintenance instructions.
 - 4. Replacement parts information.
- B. Schedule: Submit a toilet accessory schedule, indicating the type and quantity to be installed in each washroom. Use room numbers as indicated on the Drawings.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.
- D. Hazardous Materials: Comply with EU Directive "Restrictions of Hazardous Substances (RoHS) requirements."

1.06 DELIVERY, STORAGE AND HANDLING

- A. Pack accessories individually in a manner to protect accessory and its finish.
- B. Protect adjacent or adjoining finished surfaces and work from damage during installation of work of this section.

1.07 WARRANTY

- A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1-year warranty for materials and workmanship.
- B. Mirrors: Provide manufacturer's 15-year guarantee against silver spoilage.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Manufacturer: Bobrick Washroom Equipment, Inc., or approved equal as follows:
 - 1. Toilet Tissue Dispenser for Two Rolls: Contura Series B-4288.
 - 2. Surface-Mounted Sanitary Napkin Disposal: Contura Series B-270
 - 3. Stainless Steel Angle Frame Mirror: B-290, size as indicated on drawings.
 - 4. Grab Bars: B-6806, 1-1/2 inch diameter, length as indicated on drawings, stainless steel with concealed mountings.
 - 5. Surface-Mounted Robe Hook: Classic Series B-7671.
 - 6. Shower Curtain Rod: B-6107, verify length in field.

7. Shower Curtain Hooks: 204-1, verify quantity in field.
 8. Shower Curtain: 204-3, verify length in field.
 9. Surface Mounted Toilet Seat Cover Dispenser: Classic Series B-221.
 10. Paper Towel Dispenser and Waste Receptacle: TrimLine Series: B-38032
 11. Surface Mounted Heavy-Duty Manual Liquid Soap Dispenser: 818615
- B. Manufacturer: Swanstone, or approved equal as follow:
1. Reinforced Solid Surface Single Threshold Shower Pan.
 - a. Model: SS-3460.
 - b. Finish: Pebbled, slip-resistant surface.
 - c. Color: Bisque (018).
 2. Solid Surface Recessed Shampoo/Soap Caddy
 - a. Model: RS-2413 Aerie Niche
 - b. Color: Bisque (018)

PART 3 – EXECUTION

3.01 PREPARATION

- A. Deliver inserts and rough-in frames to jobsite at appropriate time for building-in. Provide templates and rough-in measurements as required. Verify that all required backing and blocking is provided.
- B. Before starting work notify Architect in writing of any conflicts detrimental to installation or operation of units.
- C. Verify with Architect exact location of accessories.
- D. Provide templates and rough-in measurements for preparation of opening in toilet partitions.

3.02 INSTALLATION

- A. Install fixtures, accessories, and items in accordance with manufacturer's printed instructions.
- B. Install true, plumb and level, securely and anchored to substrate.

END OF SECTION

**SECTION 10 41 16
EMERGENCY KEY CABINET**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Emergency key cabinet for Fire Department access.

1.02 COORDINATION

- A. Furnish inserts and anchorages which must be built into other work for installation of recessed emergency key cabinet. Coordinate delivery with other work to avoid delay.

1.03 SEQUENCING AND SCHEDULING

- A. Sequence delivery and installation of items until construction is ready for their installation to minimize possibility of damage.

1.04 ACTION SUBMITTALS

- A. Product Data: Technical data for each item including manufacturer, material descriptions including size and weight, finishes, performance data, manufacturer cut sheets, assembly and disassembly, storage instructions for portable items, and other available pertinent data.

1.05 QUALITY ASSURANCE

- A. Catalog Standards: Manufacturer's catalog numbers or names may be indicated on Drawings or specified for convenience in identifying miscellaneous specialties items. Unless otherwise indicated, manufacturer's current catalog description for indicated number and specified in options or accessories constitutes requirements for each type of item.
 - 1. Use of catalog numbers and specific requirements indicated on Drawings and in Specification are not intended to preclude use of comparable items by acceptable manufacturers, but are given for purpose of establishing standard of design and quality for materials, construction and workmanship.
- B. Source Limitations: Obtain each type of item from single source from single manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire performance characteristics, and lot number.
- B. Store emergency key cabinet in original undamaged packages and containers, inside well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
- C. c. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Manufacturer(s) listed included for convenience of Contractor in establishing quality, performance, function, and aesthetic appearance acceptable to Architect.
- B. Other manufacturers approved by Architect may be used whose qualities meet or exceed specified manufacturer.

2.02 EMERGENCY KEY CABINET

- A. Fire Control Key Box: Provide as follows:
 - 1. Mounting Type: Surface Mount.
 - 2. Mounting Location: To be determined by local Fire Department.
 - 3. Basis of Design Product: Knox Box. 3200 Series by Knox Company.
 - a. Contractor shall confirm size, capacity and color with local fire department prior to ordering.

2.03 FABRICATION

- A. General: Provide emergency key cabinet manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions, using concealed fasteners appropriate to substrate and recommend by manufacturer of units.
- B. Install units level, plumb, and firmly anchored in locations and at heights indicated.

3.03 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust cabinet door to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Replace cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

**SECTION 10 44 00
FIRE EXTINGUISHERS**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Fire extinguishers and fire extinguisher cabinets.

1.03 SUBMITTALS

- A. Submit fully detailed shop drawings giving sizes, methods of attachment, and all required accessories. Submit manufacturer's data for all items supplied under this section of work.
 - 1. Provide fully recessed or surface mounted cabinets, as required for wall types.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pack accessories individually in a manner to protect accessory and its finish.
- B. Protect adjacent or adjoining finished surfaces and work from damage during installation of work of this section.

PART 2 – PRODUCTS

2.01 FIRE EXTINGUISHER CABINET AND FIRE EXTINGUISHER

- A. Recessed Fire Extinguisher Cabinet: Larsen's Manufacturing Co., Architectural Series, Model Number: SS2409-R1, or equal. Cold rolled steel cabinet, trims and door frames, with recessed style, "Vertical Duo" door style, Stainless Steel #4 finish. Provide with "Larsen-Loc" system for securing cabinet.
- B. Recessed Fire Extinguisher Cabinet (Fire Rated): Larsen's Manufacturing Co., Architectural Series, Model Number: FS SS2409-R1, or equal. Cold rolled steel cabinet, trims and door frames, with recessed style, "Vertical Duo" door style, Stainless Steel #4 finish. Provide with "Larsen-Loc" system for securing cabinet.
- C. Fire Extinguisher Bracket (surface mounted at electrical room): Larsen's Manufacturing Co., Model Number: 846, or equal.
- D. Fire Extinguishers: Larsen's Manufacturing Co.
 - 1. Model Number: MP5.
 - 2. Model Number: MP10 at electrical room.
- E. Provide quantities as indicated on drawings.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Deliver inserts and rough-in frames to jobsite at appropriate time for building-in. Provide templates and rough-in measurements as required.
- B. Before starting work notify Architect in writing of any conflicts detrimental to installation or operation of units.
- C. Verify with Architect exact location of accessories.

3.02 INSTALLATION

- A. Install fire extinguishers and fire extinguisher cabinets in accordance with approved shop drawings.
- B. Install true, plumb and level, securely and anchored to substrate.
- C. Provide approved identification to meet Fire Marshal's requirements.

END OF SECTION

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**SECTION 10 50 00
METAL TURNOUT LOCKERS**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes Metal Turnout Lockers.

1.02 RELATED SECTIONS

- A. Section 09 29 00 – Gypsum Board

1.03 SUBMITTALS

- A. Submit according to provisions of Section 01 30 00 - Administrative Requirements
- B. In addition to product data and installation instructions, provide samples of each color and finish required.
- C. Submit shop drawings for metal lockers, verifying dimensions affecting locker installation; include installation details, bases, trim, accessories, and numbering sequence information.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. "Personnel Wall Mount Lockers" storage systems manufactured by GearGrid Corporation, or equal. Color shall be "Red Baron". Provide locker dimensions per the drawings.

2.02 LOCKER FABRICATION

- A. Construction: All storage systems shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock down shipping, to secure units to mounting surface and on applicable accessories.
- B. Vertical Dividers: Outer frames shall be made of 1.25" O.D. x 16 gauge wall thickness ASTM A513 steel tubing. Inner grid shall be fabricated from .25" diameter ASTM A510 cold drawn steel wire resistance welded to a 3" square pattern. Grid design allows for ventilation and attachment of system accessories. Steel surface finish to be capable of receiving a durable powder coated finish.
- C. Mesh back Panel: Shall be manufactured from .25" diameter ASTM A510 cold drawn steel wire resistance welded to a 3" square pattern. Panel design allows for attachment of accessories to compliment maximum usage of unit. Wire surface finish to allow application of durable powder coated finish.
- D. Top and Bottom Shelves: Both shelves shall be manufactured from .25" diameter ASTM A510 cold drawn steel wire resistance welded. All bends to be cold formed. Top shelf includes a 20 gauge steel bracket for the mounting of name placards if required. Wire surface finish to allow application of durable powder coated finish.
- E. Accessories: Provide for each individual locker opening.
 - 1. Three (3) hooks shall be supplied with each individual system opening. Hook design allows placement on either grid side panels or mesh back panel. Hooks are cold formed wire resistance welded into a quick-detachable unit. Hook material allows for durable powder coated finish.
 - 2. GearDryer & GearGlove Hangers: Shall be fabricated from .25 diameter 304 stainless steel wire. All bends to be cold formed and joints resistance welded. Hook ends to be coated with black vinyl finish.
 - 3. GearHanger Horizontal Hanging Rod: Horizontal Hanger Rod shall be made of 1.25" O.D. x 16 gauge wall thickness 304 stainless steel tubing with .25" diameter ASTM A510 cold drawn steel wire mounting hooks at each end. Rod to be coated with durable powder coat finish.

- 4. HeavyHanger: Heavy duty hanger, constructed of 1/4" stainless steel, for use with GearHanger horizontal hanging rod.
- F. Finish: All system components excluding mounting and assembly hardware shall be finished as follows: Components to be cleaned using a phosphatized bath, clear water rinse and electrostatically coated with a durable TGIC powder coating.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Verify that proper backing is installed for mounting of locker units.
- B. Install plumb, level, rigid in compliance with manufacturer's instructions.
- C. Fasten lockers securely to wall.
- D. Touch up any scratches in finish coat prior to final acceptance.

END OF SECTION

SECTION 10 75 00 FLAGPOLES

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes a complete flagpole with all required hardware.

1.02 RELATED SECTIONS

- A. Section 03 30 00 – Cast In Place Concrete.

1.03 SUBMITTALS

- A. Submit in accordance with the provisions of Section 01 30 00 – Administrative Procedures.
- B. Manufacturer's Data: Furnish manufacturer's specifications and installation instructions, including general layout, dimensions, finishes, anchoring and support system, trucks, and finials,

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Spiral wrap flagpole with heavy kraft paper, wood strip and steel band or polyethylene wrap and pack in tube prior to shipment.
- B. Deliver flagpole in original wrappings and in one piece.
- C. Store flagpole, in original wrappings, in area protected from weather, moisture, and damage.
- D. Handle flagpole so as to prevent damage or soiling.

1.05 WARRANTY

- A. Standard manufacturer's warranty on materials of two (2) years from date of delivery to jobsite or date of installation, whichever is later, and includes the aluminum used to construct the flagpole, the cleat, the truck and the ball, against all defects in workmanship.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Provide flagpoles as complete unit, furnished by single acceptable manufacturer, including accessories and anchorage devices.
 - 1. Basis of Design: L.Ph. Bolander & Sons, Inc., Model: LTS30', or equal.
- B. Flagpoles shall be seamless aluminum, clear anodized finish, 30' high, ground set, ornamental low profile base and standard foundation base, with internal halyard and locking internal access door.
 - 1. Truck Assembly: Internal halyard, single pulley truck, to be provided and coordinated with beacon.
- C. Cleats and vandal cover:
 - 1. Quantity: One per halyard.
 - 2. Size: 9 inch.
 - 3. Material: Cast aluminum with stainless steel fastenings.
 - 4. Vandal Cover: Provide manufacturer's standard vandal proof hinged, lockable cover.
 - 5. Internal Halyard: One #10 (5/16"), Solid Braid Polyester, equipped with chrome swivel snaps to secure two flags.
 - 6. Provide two polyester 6' x 10' American flags.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Inspect foundations for proper depth and size of sleeve.

3.02 INSTALLATION

- A. Paint portions of flagpole below grade with heavy coat of bituminous paint.

- B. Install flagpoles, base assemblies, and fittings in compliance with shop drawings and manufacturer's instructions.

3.03 TEST AND ADJUST

- A. Check and adjust installed fittings for smooth operation of halyards.

END OF SECTION

**SECTION 10 85 00
MISCELLANEOUS ACCESSORIES**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Miscellaneous accessories for interior or exterior installation.

1.03 SUBMITTALS

- A. Manufacturer's Data to describe and illustrate each accessory at large scale and show installation method including requirement for blocking and backing, by others.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pack accessories individually in a manner to protect accessory and its finish.
- B. Protect adjacent or adjoining finished surfaces and work from damage during installation of work of this section.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Corner Guard: Type 304, 18-gauge, Stainless Steel, 1-1/2" x 1-1/2" x 48" corner guards, by IPC, Miller Protection Systems, American Floor Products Co. Inc., or equal. Provide with #4 satin finish.
- B. 911 Phone: ADA Outdoor Telephone, #GB70VNXX, by Allen Tel Products, Inc. (Www.allentel.com), or equal. Provide in red color. Label as 911 Emergency Phone.
- C. Public Notice Board: 18" x 24" "Superior Pin Notice Board for External Use", by Horizon Signs LTD. or equal.
- D. Dryer Box: Model #425 Dryer Box, by In-O-Vate Technologies, Inc., or equal
- E. Oscillating Wall Fan (Fitness): 24-inch / 30-inch oscillating wall fan, #24883/24884, by OEM Tools, or equal.

2.02 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be as recommended by the manufacturer of the materials used.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Deliver inserts and rough-in frames to jobsite at appropriate time for building-in. Provide templates and rough-in measurements as required.
- B. Examine the areas and conditions under which materials are to be placed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- C. Verify that required solid blocking and backing is provided as necessary for installation of specified units.

3.02 INSTALLATION

- A. Install in continuous sections per manufacturer's recommendations
- B. Install all items true, plumb and level, securely and anchored to substrate.

END OF SECTION

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SECTION 11 30 00
KITCHEN, LAUNDRY & SPECIALTY EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Mechanical and Plumbing requirements are specified in Divisions 22 and 23.
- B. Electrical services and connections are specified in Division 26.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of kitchen equipment. Submit operating and maintenance instructions for each item of equipment.
- B. Product Warranties: Submit manufacturer's warranty for each item of equipment.
- C. Provide all available extended warranties for equipment.

1.03 COORDINATION

- A. Verify that all equipment provided will function properly with the building elements as indicated, including mechanical, plumbing and electrical connections. Immediately notify Architect of any discrepancies.

PART 2 - PRODUCTS

2.01 EQUIPMENT FOR FIREHOUSE

- A. Finish: All equipment shall have a stainless steel finish, unless otherwise noted.
- B. Dishwashers: Bosch 800 series SGE78C55UC
- C. Refrigerator & Freezer: LG lrfc2706s
- D. Range: Viking 7 Series Gas Range VGR7482-8B Gas Range, 8 burners
- E. Range Hood: Viking 5 Series VWH548481 48" Hood with exhaust discharge mounted exterior blower model # DEV1200 (1200 CFM)
- F. Stacked Washer/Gas Dryer: Speed Queen 3.5 Washer/7.0 Dryer SF7007WG, White
- G. BBQ Grill: Viking VQGFS5361 with ceiling mounted exhaust discharge model #VWHO 18 4878SS (1200 CFM)
- H. Microwave: Viking RVM320SS Countertop Microwave
- I. Coffee Brewer: BUNN CWTF15-APS Airpot System with Gourmet Funnel (23001.0051)
- J. Television: 50" Class BRAVIA 3 LED 4K UHD Smart Google TV

2.02 EQUIPMENT FOR LIBRARY

- A. Under-counter Safe
- B. Exterior Book Return Drop: Kingsley #K-C50SS 50 C-Series 4 Ever System, including braille labels, close kit, 4 extra keys, & time saver wifi cart accessory
- C. Television: 50" Class BRAVIA 3 LED 4K UHD Smart Google TV
- D. Trash bin: Simplehuman, Uline # H-8664
- E. Microwave: Viking RVM320SS Countertop Microwave
- F. Coffee Brewer: BUNN CWTF15-APS Airpot System with Gourmet Funnel (23001.0051)

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation: Comply with manufacturer's instructions and recommendations.

- B. Built-In Equipment: Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed. Verify that all required backing and blocking is provided to secure equipment to structure.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify clearances are adequate for proper operation of equipment.
- D. Utilities: Refer to Divisions 22, 23 and 26 for plumbing, mechanical and electrical requirements.
- E. Testing: Test each item of equipment to verify proper operation. Make necessary adjustments.
- F. Accessories: Verify that accessory items required have been furnished.
- G. Cleaning: Remove packing material from equipment items and leave units in clean condition, ready for operation.

END OF SECTION

**SECTION 12 24 00
ROLLER WINDOW SHADES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.
- B. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.02 SUMMARY

- A. Section includes manual-operated roller shades with single rollers.

1.03 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 08 41 13 - Aluminum Framed Exterior Storefront
- C. Section 08 51 13 - Aluminum Windows
- D. Section 09 21 16 - Gypsum Board Assemblies
- E. Section 12 51 00 - Window Blinds

1.04 ACTION SUBMITTALS

- A. Submit under the provisions of Section 01 30 00 – Administrative Procedures.
- B. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- C. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- D. Samples for Initial Selection:
 - 1. For each type and color of shadeband material.
 - 2. Include Samples of accessories involving color selection.
- E. Samples for Verification: For each type of roller shade.
 - 1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
 - 2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
 - 3. Installation Accessories: Full-size unit, not less than 10 inches long.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and installer.
- B. Product Certificates: For each type of shadeband material, signed by product manufacturer.
- C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm with not less than 10 years' experience regularly engaged in the production and sales of roller window shades that have been used for similar applications with successful results, that meet or exceed performance requirements indicated, and of documenting this performance by inclusion in test reports, labels, and

calculations. Manufacturer shall have factory-authorized service representatives who are available for consultation, periodic Project-site observations, and on-site assistance.

- B. Installer Qualifications: A firm with not less than 5 years' experience installing roller window shades similar in material, design, and extent to that indicated for this Project, whose work has resulted in installations with a record of successful in-service performance, and that employs installers and supervisors who are trained and approved by manufacturer to perform work of this Section.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.09 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which roller shade manufacturer agrees to repair or replace roller shade hardware which fails in material or workmanship within the specified warranty period.
 - 1. Warranty Period for Shade Cloth: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer and Products: Subject to compliance with requirements, provide the following:
 - 1. Draper Inc., or Equal

2.02 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Stainless steel.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: Right side of inside face of shade.
 - 2. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Installation Accessories:
 - 1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open.
 - b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
 - 2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - a. Closure-Panel Width: 2 inches.
 - 3. Where light-blocking fabric is indicated, provide the following:
 - a. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
 - b. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
 - 4. Installation Accessories Color and Finish: Custom color to match Architect's sample.

2.03 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Source: Roller-shade manufacturer.
 - 2. Roll Width: Custom, as indicated on Drawings, or if not indicated, coordinated to align with window mullions.
 - 3. Openness Factor: 3%
 - 4. Basis-of-Design Product: Phifer SheerWeave 4400, or equal.
 - 5. Color: As selected by Architect from manufacturer's full range of standard colors.

2.04 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 degrees Fahrenheit:
 - 1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

3.03 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.04 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

**SECTION 12 51 00
WINDOW BLINDS**

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes manual-operated blackout window blinds.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 08 41 13 - Aluminum Framed Exterior Storefront
- C. Section 08 51 13 - Aluminum Windows
- D. Section 09 21 16 - Gypsum Board Assemblies
- E. Section 12 24 00 - Roller Window Shades

1.03 SUBMITTALS

- A. In addition to manufacturer's product data and installation instructions, submit the following:
 - 1. Samples of materials and finishes.
 - 2. Shop drawings for installations not fully detailed in product data.

1.04 QUALITY ASSURANCE

- A. Provide complete assemblies produced by one manufacturer for each type required, including hardware, accessory items, mounting brackets, and fastenings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. "Duette FR Honeycomb 3/4" Opaque Shades", by Hunter Douglas, or equal. Provide standard window shade unit complete with operating mechanisms, valance and accessories.
 - 1. Fabric shall be permanent, flame resistant, blackout, non-woven polyester formed into opaque 3/4" hexagonal honeycomb tubular cells, in stacked construction.
 - a. Single cell construction with each cell an independent piece of fabric and containing a metalized polyester film core.
 - b. Color shall be as selected by Architect. Finish to be duotone.

2.02 FABRICATION

- A. Fabricate units to completely cover openings for wall mount installation. For continuous window wall installations, fabricate units so that ends occur only over mullions or other defined vertical separations, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install units to comply with manufacturer's instructions for type of mountings and operations required. Position units plumb and true, securely anchored in place with recommended hardware and accessories to provide smooth, easy operation.

END OF SECTION

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SECTION 21 00 50
BASIC FIRE SPRINKLER MATERIALS AND METHODS

BASIC FIRE SPRINKLER MATERIALS AND METHODS

GENERAL

2.01 SUMMARY

- A. Section Includes:
 - 1. Electric motors.
 - 2. Motor starters.
 - 3. Valve Boxes.
 - 4. Access doors.
 - 5. Expansion loops.
 - 6. Insulation.

2.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is part of each Division 21 Section.

2.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- C. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2017.
- D. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; 2025.
- F. NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems; 2026.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

2.04 ADDITIONAL REQUIREMENTS

- A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.
- B. Make temporary connections required to maintain services during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before interrupting services.

2.05 REFERENCES AND STANDARDS

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at time of bid shall be used.
 - 1. ANSI - American National Standards Institute.
 - 2. ASTM - American Society for Testing and Materials.
 - 3. CCR - California Code of Regulations.
 - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
 - 4. NCPWB - National Certified Pipe Welding Bureau.
 - 5. CEC - California Electrical Code.

6. NEMA - National Electrical Manufacturers' Association.
 7. NFPA - National Fire Protection Association, as amended by the CBC.
 8. OSHA - Occupational Safety and Health Act.
 9. UL - Underwriters' Laboratories, Inc.
- B. Requirements of Regulatory Agencies:
1. The publications listed below form part of this Specification. Comply with provisions of these publications except as otherwise shown or specified.
 2. Code editions shall be as noted on Drawings, as adopted by the California Division of the State Architect (DSA).
 - a. California Building Code.
 - b. California Electrical Code.
 - c. California Energy Code.
 - d. California Fire Code.
 - e. California Green Building Standards Code.
 - f. California Mechanical Code.
 - g. California Plumbing Code.
 - h. California Code of Regulations, Title 24.
 - i. California Health and Safety Code.
 - j. CAL-OSHA.
 - k. California State Fire Marshal, Title 19 CCR.
 - l. DSA - Division of the State Architect. Interpretive Regulations (IR's).
 - m. National Fire Protection Association, as amended by the CBC.
 - n. Occupational Safety and Health Administration.
 - o. Other applicable state laws.
 3. Nothing in Drawings or Specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or Specifications to repeat requirements of codes except where necessary for clarity.

2.06 DRAWINGS

- A. Examine Contract Documents prior to bidding of Work and report discrepancies in writing to Architect.
- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The fire protection Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
1. Architectural and structural Drawings are part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over fire protection Drawings.
 2. Because of the small scale of fire protection Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in locations shown. Obtain Architects' approval prior to relocation of equipment and materials.
 3. Relocate equipment and materials installed without prior approval of Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
 4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

- C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

2.07 FEES AND PERMITS

- A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with the requirements of Division 1.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
 - 1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.

2.08 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. General:
 - a. Coordinate Work in this Section with trades covered in other Specification Sections to provide a complete and operable installation of highest quality workmanship.
 - 2. Electrical Coordination:
 - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified in this Section. Contractor has full responsibility for the following items of work:
 - 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
 - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of bid.
 - 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
 - 3. Mechanical Coordination:
 - a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
 - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
 - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

2.09 SUBMITTALS

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
 - 1. Partial or incomplete submittals will not be reviewed.
 - 2. Quantities are Contractor's responsibility and will not be reviewed.
 - 3. Provide materials of same brand or manufacturer for each class of equipment or material.

4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
 - a. Submit shop drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
 - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
 - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
 - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- C. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- D. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
 1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Contract Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from Contract Documents shall be clearly identified and appear at the beginning of submittal package, and shall be referenced to applicable Contract Documents requirements.
- E. Provide layouts for fire protection systems, for inclusion in coordinated layout specified in Section 23 80 00. Comply with requirements for layouts specified in Section 23 80 00.

2.10 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for fire protection systems materials and products.
- B. Shop Drawings.
- C. Provide product data for insulation products, including insulation, insulation facings, jackets, adhesives, sealants, and coatings, indicating compliance with requirement that these products contain less than 0.1 percent (by mass) polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations.
- D. Product Data for California Green Building Standards Code Compliance: For adhesives and sealants, including primers, documentation of compliance including printed statement of VOC content and chemical components.
- E. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
 2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
- F. Delegated-Design Submittal: For seismic supports, anchorages, and restraints indicated to comply with performance requirements and design criteria.
1. Calculations performed for use in selection of seismic supports, anchorages, and seismic restraints shall utilize criteria indicated in Structural Contract Documents.
 2. Supports, anchorage and restraints for piping and equipment shall be an HCAI pre-approved system such as Tolco, ISAT, Mason, or equal. Pipes and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code and NFPA 13. System shall have current OPA number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
 - a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.
 3. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, equipment, and restraint locations, and detailing supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with California Building Code and NFPA 13.
 4. Additional Requirements: In addition to the above, conform to State and local requirements.

2.11 INFORMATIONAL SUBMITTALS

- A. Provide coordination drawings for fire protection systems in accordance with the requirements of Specification Section 21 10 00.
- B. Furnish to Project Inspector complete installation instructions on material and equipment before starting installation.

2.12 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
 1. Refer to Division 01 for complete instructions.
 2. Furnish three complete sets of Operating and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operating and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Start compiling data upon approval of submittals.
 - a. Sets shall incorporate the following:
 - 1) Product Data.
 - 2) Shop Drawings.
 - 3) Record Drawings.
 - 4) Service telephone number, address and contact person for each category of equipment or system.
 - 5) Complete operating instructions for each item of fire sprinkler system.
 - (a) Original manual of NFPA 25 for fire sprinkler system.
 - 6) Copies of guarantees/warranties for each item of equipment or systems.
 - 7) Test data as specified.

- 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
 - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
 - 10) A complete list or schedule of scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
 - 11) Check test and start reports for each piece of fire protection equipment provided as part of the Work.
 - 12) Commissioning and Preliminary Operation Tests required as part of the Work.
- b. Post service telephone numbers and addresses in an appropriate place designated by Architect.
- B. Record Drawings:
1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
 2. Upon completion of the work, deliver to Architect the following:
 - a. Originals of drawings showing the Work exactly as installed.
 - b. One complete set of reproducible drawings showing the Work exactly as installed.
 - c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
 - d. Provide Contractor's signature, verifying accuracy of record drawings.
 - e. Obtain the signature of the Project Inspector for all record drawings.

2.13 SUBSTITUTIONS

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given in this Section and those of Division 01, Division 01 requirements shall apply.
- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be manufacturers other than those specifically listed in Contract Documents by brand name, model, or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
 1. Reason for substitution request.
 2. Complete submittal information as described herein; see "Submittals."
 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
 5. Explanation of impact on connected utilities.
 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material will not waive these requirements.
- G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

2.14 DELIVERY, STORAGE AND HANDLING

- A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

2.15 FIELD CONDITIONS

- A. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by Architect and shall be made without additional cost to Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify Architect if services are found which are not shown on Drawings.

2.16 WARRANTY

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within warranty period, including damage caused by leaks.
- C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

PRODUCTS

3.01 GENERAL

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum.
- C. Refer to Section 21 10 00 for specific system piping materials.

3.02 MATERIALS

- A. No material installed as part of this Work shall contain asbestos.
- B. California Green Building Code Compliance:
 - 1. Fire protection equipment shall not contain CFCs.
 - 2. Fire protection equipment shall not contain Halons.

3.03 ELECTRIC MOTORS

- A. U.S. Motors, Century Electric, General Electric, Lincoln, Gould or equal. Minimum efficiencies shall be as defined by IEEE 112 Test Method B and NEMA MG1. Provide NEMA 3R enclosure where exposed to outdoors.

3.04 MOTOR STARTERS

- A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.
- B. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
 - 1. All three-phase starters shall have the following:
 - a. Provide magnetic motor starters for equipment provided under the fire protection Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
 - b. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
 - c. Three ambient compensated thermal overload.
 - d. Fused control transformer (for 120 or 24 volt service).

- e. Pilot lights, integral with starters. Starters located outdoors shall be installed in NEMA IIIIR enclosures.

3.05 VALVE BOXES

- A. General:
 - 1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular "vault" type adequately sized for condition and similar in construction to those specified above.
 - 2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
 - 3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.
- B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.
- C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.
- D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron or steel locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

3.06 ACCESS DOORS

- A. Where floors, walls, or ceilings must be penetrated for access to fire protection equipment or devices, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
 - 1. Access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08, except as noted in this Section.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for other areas.
- D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with Architect when access is required in these areas.
- E. Where specific information or details relating to access panels different from the above is shown or given on Drawings or other Divisions of work, that information shall supersede this specification.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
 - 1. Milcor:
 - a. Style K (plaster).
 - b. Style DW (gypsum board).
 - c. Style M (masonry).
 - d. Style "Fire Rated" where required.

3.07 EXPANSION LOOPS

- A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend or center section of flexible hose. Flexible hose shall consist of corrugated metal inner hose and braided outer sheath. Provide UL listed assembly selected for 4 inches of movement.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1. Metraflex Inc., Fireloop series.
 - 2. Unisource Manufacturing, Inc., V series.

3.08 EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.
- B. Text of Signs: Provide identification of equipment unit number, and room or area served. Coordinate name of area served with final room names and numbers for the facility. In addition, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.09 PIPE IDENTIFICATION

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legends and flow arrows shall conform to ASME A13.1.

3.10 INSULATION WORK

- A. General:
 - 1. Adhesives shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
 - 2. The term "piping" used herein includes pipe, valves and fittings.
 - a. Apply insulating cement to fittings, valves and strainers and trowel smooth to equal the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to bonnet. Leave strainer cleanout plugs accessible.
 - b. Provide pre-formed PVC valve and fitting covers.
 - c. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
 - 3. Test insulation, jackets, and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL 723, ASTM E84, or NFPA 255.
 - 4. Clean thoroughly, test and have approved, piping and equipment before installing insulation and/or covering.
 - 5. Repair damage to existing pipe insulation whether or not caused during Work of the Contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.
- B. Insulation of Piping:
 - 1. Insulate fire protection piping located outside building exposed to weather with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness for all pipe sizes: 2 inches.
 - 2. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2-inch stainless-steel bands on 12-inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
 - a. Fitting covers:
 - 1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.

- 2) Tee covers.
 - 3) Flange and union covers.
 - 4) End caps.
 - 5) Beveled collars.
 - 6) Valve covers.
 - 7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- b. Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket.
 - c. Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket.

EXECUTION

4.01 FRAMING, CUTTING AND PATCHING

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- D. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

4.02 ELECTRICAL REQUIREMENTS

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the fire protection Work with the electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for controls. Before permitting operation of equipment which is furnished, installed, or modified under this Section, Contractor shall review associated electrical work, including overload protection devices, and assume complete responsibility for correctness of electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. Equipment and connections exposed to weather shall be installed in NEMA IIIIR enclosures with factory wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with fire protection system are included in this Section. Wiring and conduit shall comply with Division 26.
- D. Electric Motors:
 1. Motors shall be rated for continuous operation at 115% of nameplate amperage but shall be selected to operate at less than nameplate amperage throughout entire operating cycle. Motors found to exceed nameplate amperage shall be promptly replaced at no cost to Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by motor manufacturer. Match the nameplate voltage rating with electrical service supplied. Check electrical Drawings. Provide transformer for each motor not wound specifically for system voltage.
- E. Motor Starters:
 1. Provide magnetic motor starters for equipment provided under the fire protection Work. Starters shall be non-combination type. Provide part-winding or reduced voltage start motors on motors 50 – HP and larger, or where shown or as hereinafter specified. Minimum size starter shall be Size 1. Three-phase starters shall have the following:
 - a. Cover-mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.

- b. Three ambient compensated thermal overload.
- c. Fused control transformer (for 120 or 24 volt service).
- d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
- 2. Starters for single-phase motors shall have thermal overloads, Westinghouse Type MSTOLSLIP, Square D, or equal, toggle-operated with pilot light, NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
- 3. Provide OSHA label indicating that the device starts automatically.

4.03 PIPING SYSTEM REQUIREMENTS

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

4.04 PRIMING AND PAINTING

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. See Division 09 Painting Section(s) for detailed requirements.
- C. Priming and Painting:
 - 1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
 - a. Black Steel Piping:
 - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
 - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
 - 2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the highest grade zinc rich primer. After erection or installation, primed surfaces shall be properly cleaned of foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Abrasion or other damage to shop or field prime coat shall be properly repaired and touched up with same material used for original priming.
 - 3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

4.05 EXCAVATING

- A. Perform excavating required for Work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide 3 foot minimum cover for fire piping, or 1 foot below frost line, whichever results in deepest installation. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For PVC pipe, bed pipe in 4 inch deep minimum sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. Other materials should have minimum sand equivalent of 50. Only a small proportion of native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that less than 100

percent will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

- C. Maintain warning signs, barricades, flares, and red lanterns as required.
- D. For trenches 5 feet or more in depth, submit copy of permit, and detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during excavation of such trenches. Obtain a permit from Division of Industrial Safety prior to beginning excavations. A copy of permit shall be available at the Project site.

4.06 BACKFILLING

- A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.
- B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
 - 1. Backfill plastic pipe and insulated pipe with sand for minimum distance of 12 inches above the top of pipe. Compact using mechanical tamping equipment.
- C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase minimum compaction within uppermost two feet of backfill to 95 percent.
- D. Replace or repair to its original condition sod, concrete, asphalt paving, or other materials disturbed by trenching operation. Repair within warranty period.
- E. Thrust Blocks:
 - 1. Provide concrete anchors or thrust blocks on PVC and cast iron water lines installed underground. Install thrust blocks at changes in direction and at connections to mains 1-1/2 inches and larger. Form thrust blocks by pouring concrete between pipes and trench wall. Thrust blocks shall be adequate in size and placed to take thrusts created by the maximum internal water pressure; sizing and placement shall be per manufacturer's recommendations and in accordance with requirements of NFPA 24.
 - 2. Anchor piping to building construction.

4.07 PIPING SYSTEMS INSTALLATION

- A. At time of final connection, and prior to opening valve to allow pressurization of water piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on fire protection piping is greater than 175 psi, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.
- B. General:
 - 1. Piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
 - 2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
 - 3. Install piping to permit application of insulation where required and to allow valve servicing.
 - 4. Where piping or conduit is left exposed within a room, the piping or conduit shall be run true to vertical, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
 - 5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from Architect.

6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
 7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
 8. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
 9. Install horizontal valves with valve stem above horizontal.
 10. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
 11. Verify final equipment locations for roughing-in.
 12. Service Markers: Mark location of each plugged or capped pipe with 4 inch round by 30 inch long concrete marker, set flush with finished grade. Provide 2-1/2 inch diameter engraved brass plate as part of service marker.
 13. Where piping is installed in walls within one inch of face of stud, provide 16 gauge sheet metal shield plate on face of stud. The shield plate shall extend minimum 1-1/2 inches beyond outside diameter of pipe.
- C. Expansion Loops:
1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
 2. Install expansion loops of sizes matching sizes of connected piping.
 3. Install grooved-joint expansion joints to grooved-end steel piping.
 4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by piping system in which expansion loop is installed.
- D. Sleeves:
1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations, as directed, shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
 2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate pipe from concrete.
- E. Floor, Wall, and Ceiling Plates:
1. Fit pipes, with or without insulation, passing through walls, floors, or ceilings, and hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.
- F. Firestopping:
1. Pack annular space between pipe sleeves and pipe through floors and walls with UL listed fire stop, and seal at ends. Pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
 - a. Install fire caulking behind fire protection services installed within fire rated walls, to maintain continuous rating of wall construction.
 2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators, or equal, for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and with Chapter 7, CBC requirements.
 3. Sleeve penetrators shall have built in anchor ring for waterproofing and anchoring into concrete pours or use special fit cored hole penetrator for cored holes.
 4. Copper and steel piping shall have SpecSeal plugs, or equal on both sides of penetrator to reduce noise and to provide waterproofing.
 5. All above systems to be installed in strict accordance with manufacturer's instructions.

6. Alternate firestopping systems are acceptable if approved as equal. Contractor is responsible for determining suitability of alternate products for their intended use, and shall assume all risks and liabilities in connection with the use of alternate products.
- G. Flashing:
1. Flashing for penetrations of metal or membrane roof for fire protection items shall be coordinated with roofing manufacturer and roofing installer for specific roofing type utilized. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for fire protection work.
 - a. Furnish and install flashing and counterflashing in strict conformance with requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
 - b. Furnish and install counterflashing above each flashing required. Elmdor/Stoneman Model 1540, or equal.
 2. For other types of roofing systems, furnish and install around each pipe, where pipe passes through roof, a flashing and counterflashing. Flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. Elmdor/Stoneman Model 1100-4, or equal.
- H. Hangers and Supports:
1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers as required. Hangers and supports shall be UL listed for fire protection service. Components shall support weight of equipment, pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, shall be of same size as pipe or tubing on which used, or nearest size available. Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide "trapeze" (bridging) support members attached to building structural members by methods approved by structural Engineer.
 - a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
 2. Hanger components shall be provided by one manufacturer. B-Line, Grinnell, Tolco, Afcon, Loos & Co., Uni-Strut, or equal.
 3. Hanger and Supports:
 - a. Vertical Piping: Tolco Fig. 6, or equal, clamps attached to pipe above each floor to rest on floor. Provide intermediate support for vertical piping greater than 25 feet in length.
 - b. Individually Suspended Piping: Tolco Fig. 200 or Fig. 1 Clevis, complete with threaded rod, or equal.

Pipe Size	Rod Size
4" and Smaller	3/8"
5" to 6"	5/8"
 - c. Trapeze Suspension: Sch-10 or Sch-40 steel pipe trapeze member in accordance with NFPA 13- published load ratings.
 - d. Pipe Clamps and Straps: B-Line B2000 or B2400, Tolco, Fig. 200 or Fig. 1, or equal. Where used for seismic support systems, provide B-line B2400, Tolco fig. 69 series retainer pipe straps, or equal.
 - e. Concrete Inserts: B-line B221 continuous insert or B2500 spot insert, or equal. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
 - f. Steel Connectors: Tolco Fig. 65 beam clamps with Fig. 69 retainer straps, or equal.
 - g. Deck Connectors: Afcon Fig. 610 steel ceiling plate, or equal, where approved by structural Engineer.

4. Support to Structure:

- a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.

- 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062--MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.

- 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.

- b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of structural components. Burning or welding on structural member may only be done if approved by Architect.

5. Pipe hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced per NFPA 13, and per pipe manufacturer's listing, except as noted below.
6. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
7. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
8. Insulate copper piping from ferrous materials and hangers with two layers of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
9. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
10. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

4.08 UNIONS AND FLANGE INSTALLATION

- A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel pipe or material. Bushings or couplings shall not be used.
- B. Install unions in piping NPS 2" and smaller and flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to equipment and tanks, and at connections to automatic valves.
- C. Locate unions for easy removal of equipment, tanks, or valves.

4.09 ACCESS DOOR INSTALLATION

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of fire protection systems. Access doors shall provide for complete removal and replacement of equipment.

4.10 CONCRETE WORK

- A. Concrete work required for Work of this Section shall be included under another section of the Specification, unless otherwise noted, including reinforced concrete bases for pumps, tanks, compressors unless the work is specifically indicated on Drawings to be furnished under this Section.

- B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specifications. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

4.11 PIPE IDENTIFICATION

- A. Provide temporary identification of each pipe installed, at time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the Work.
- B. Apply legend and flow arrow at valve locations; at points where piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with approval of Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
- C. Wherever two or more pipes run parallel, markings shall be supplied in the same relative location on each.
- D. Apply markings after painting and cleaning of piping and insulation is completed.

4.12 EXPANSION ANCHORS IN HARDENED CONCRETE:

- A. Refer to Structural Drawings.
- B. Qualification Tests: The specific anchor shall have a current ICC-ES report and have been evaluated in cracked concrete in accordance with Acceptance Criteria AC193. The design shear and withdrawal load shall not be more than 80% of allowable load listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor.
- C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.
- D. Testing: Fifty percent of anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of the project inspector.
- E. The load may be applied by any method that will effectively measure tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor, or calibrated spring-loading devices. Anchors in which torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

4.13 TESTS AND ADJUSTMENTS

- A. Test installations in accordance with the following requirements and all applicable codes:
 - 1. Project Inspector should witness tests of piping systems.
 - 2. Notify Architect at least seven days in advance of tests.
 - 3. Notify local fire department of time and date of fire systems testing.
 - 4. Piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
 - 5. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
 - 6. Isolate from system equipment that may be damaged by test pressure.
- B. Test Schedule: No loss in pressure or visible leaks shall show after four hours at pressures indicated:

System Tested	Test Pressure PSI	Test With
Fire Sprinkler Piping	200	Water
Compressed Air	200	Air & Non-corrosive Leak Test Fluid
Dry Standpipes	300	Water

Wet Standpipes	200	Water

1. Piping, including underground piping, connected to fire sprinkler system shall be tested and certified in accordance with NFPA requirements, except where requirements listed in this Section exceed requirements of NFPA.
 2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with type of gas conveyed by piping system.
- C. Should material or work fail in any of these tests, it shall be immediately removed and replaced with new material, and portion of work replaced shall again be tested by Contractor at his own expense.
- D. Lubricate each item of equipment, including motors, before operation.

4.14 TRACER WIRE INSTALLATION

- A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #14 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.
- B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.
- C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as previously specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than 1/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

4.15 CHECK, TEST AND START REQUIREMENTS

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of fire protection equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
 1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
 2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
 3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
 4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

4.16 COMMISSIONING AND PRELIMINARY OPERATIONAL TESTS

- A. Prior to observation to determine final acceptance, put fire protection systems into service and check that work required has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of tests.
 - 1. Equipment has been started, checked, lubricated and adjusted in accordance with manufacturer's recommendations.
 - 2. Correct rotation of motors and ratings of overload heaters are verified.
 - 3. All manufacturers' certificates of start-up specified have been delivered to Owner.
 - 4. All equipment has been cleaned, and damaged painted finishes touched up.
 - 5. Missing or damaged parts have been replaced.
 - 6. Flushing of piping systems has been completed and water treatment equipment, where specified, is completed.
 - 7. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
 - 8. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
 - 9. Maintenance manuals have been delivered and Owner training has been completed.
- B. Review of Contractor's Tests:
 - 1. Tests made by Contractor or manufacturers' representatives are subject to observation and review by Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon completion of tests, provide letter to confirm that testing has been successful.
- C. Test Logs:
 - 1. Maintain test logs listing the tests on mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of tests.

END OF SECTION

**SECTION 21 10 00
FIRE SPRINKLER SYSTEMS**

PART 1 GENERAL

1.01 REFERENCE

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A674 - Standard Practice for Polyethylene Encasement for Ductile Iron Pipe; 2022.
- C. AWWA C606 - Grooved and Shouldered Joints; 2022.
- D. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm); 2022.
- E. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; 2025.
- G. NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems; 2026.

1.02 SUMMARY

- A. Section Includes:
 - 1. Sprinkler heads.
 - 2. Pipe and Fittings.
 - 3. Valves.
 - 4. Fire hydrant.
 - 5. Reduced pressure backflow preventer.
 - 6. Double check valve backflow preventer.
 - 7. Water flow alarm switch.
 - 8. Fire Department connection.
 - 9. Post indicator valve.
 - 10. Antifreeze system.
 - 11. Preaction (Dry) Type Sprinkler System.

1.03 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 21 00 50 Basic Fire Sprinkler Materials and Methods.

1.04 REFERENCES

- A. It is the intent of these Specifications to provide for complete and operating fire protection automatic sprinkler system in full compliance with the following standards:
 - 1. National Fire Protection Association (NFPA) Standard No. 13, 2016, as amended by the CBC.
 - 2. CBC Chapter 9.
 - 3. NFPA No. 24, 2016 (as amended).
 - 4. NFPA No. 25, 2013 (California Edition).
- B. The work shall also be in accordance with all local or state requirements that apply.

1.05 DESCRIPTION OF WORK

- A. Work of this section includes, but is not limited to, the following:
- B. Furnish all coordination, labor, design drawings, calculations, materials, tools, and equipment to install the wet pipe automatic fire sprinkler system as described in this Specification Section.

System shall be hydraulically calculated and designed for the building occupancy classification as determined by NFPA 13.

1. The Work includes, but is not limited to the following:
 - a. Complete automatic fire risers, including valves, fire department connections, flow switches, pressure switch and service mains as indicated.
 - b. Complete interior wet type automatic fire protection spray type sprinkler distribution system, including overhead service and branch mains, lateral supply piping, supports, hangers, seismic bracing, and heads
 - c. Required tests and inspections.
 - d. Provide electrical work required to complete the system. Contractor shall be responsible for providing complete and operable systems, including electrical wiring. Install wiring in conduit, in accordance with Division 26.
 - e. Protected areas shall include areas above and below the finished ceilings, exterior exposure, canopies, stairways, rooms, areaways, entry, etc, and other areas requiring sprinklers. Thoroughly examine architectural and other drawings as required to satisfy this requirement.
 - f. Tags, identification labels and instruction manuals for proper operation and maintenance.
- C. Furnish all coordination, labor, design drawings, calculations, materials, tools and equipment to install the single interlocked, supervised, pre-action automatic fire sprinkler system as described in this Specification Section. System shall be hydraulically calculated and designed for the building occupancy classification as determined by NFPA 13.
 1. The Work includes, but is not limited to the following:
 - a. Complete automatic fire risers, including valves, fire department connections, flow switches, pressure switch and service mains as indicated.
 - b. Complete interior automatic pre-action fire protection spray type sprinkler distribution system, including overhead service and branch mains, lateral supply piping, supports, hangers, seismic bracing, and heads.
 - c. Required tests and inspections.
 - d. Provide electrical work required to complete the system. Contractor shall be responsible for providing complete and operable systems, including electrical wiring. Install wiring in conduit, in accordance with Division 26.
 - e. Protected areas shall include areas above and below the finished ceilings, exterior exposure, canopies, stairways, rooms, areaways, entry, etc, and other areas requiring sprinklers. Thoroughly examine architectural and other drawings as required to satisfy this requirement.
 - f. Tags, identification labels and instruction manuals for proper operation and maintenance.
- D. Provide fire sprinklers to protect combustible building overhangs greater than 4 feet wide, as required by local authority.
- E. Determine the static and residual pressure for the site as required for accurate determination of system requirements. Base system calculations on the lowest expected static and residual pressure for the area.
 1. Test data for static and residual pressure shall be obtained from water district or local fire department; test shall be made within the last six months prior to start of work.
 2. Provide calculations based on 10 percent minimum safety factor. For hydraulically calculated fire sprinkler systems the maximum velocity in the building and the fire main piping shall not exceed 15 feet per second.

1.06 DRAWINGS

- A. Contractor shall thoroughly examine architectural, structural, and other Drawings provided as part of this Contract.

- B. Number of sprinkler heads indicated on Contract Drawings shall not be reduced. Provide additional heads required for coordination and to obtain approvals. Coordinate suitable head locations and spacing with Architect.

1.07 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer Qualifications: A firm with at least five years of successful installation experience on projects with fire sprinkler piping systems similar to that required for this Project.
 - 1. A State of California Fire Protection Contractor's license (C-16) is required.
- C. Fire Sprinkler Fitter Certification:
 - 1. Automatic fire extinguishing systems sprinkler pipefitters shall be certified by Office of the State Fire Marshall (OSFM).
- D. Design Criteria: Provide complete fire protection systems as indicated and as required by authority having jurisdiction.
 - 1. When there is conflict between requirements of authority having jurisdiction or requirements of other agencies and these Drawings and Specifications, requirements of authority having jurisdiction and recommendations of standards agencies shall govern.
 - 2. Design and install entire system in accord with applicable codes, standards, and regulations.
 - 3. The automatic sprinkler system shall conform to requirements of the National Fire Protection Association, Standard No. 13, as amended by the CBC. Contractor shall hydraulically calculate sprinkler system in accordance with NFPA 13.
 - 4. Drawings are diagrammatic only to indicate rooms/areas of sprinkler protection and piping clearances when appropriate. Rerouting of pipe and addition, deletion or relocation of heads may be necessary. Submit proposed layout for approval prior to start of installation.
 - 5. FM Compliance: Comply with Factory Mutual "Approval Guide."
 - 6. Supply equipment and accessories in accordance with requirements of all applicable national, state and local codes.
 - 7. Items of a given type shall be the products of the same manufacturer.
 - 8. Scheduled equipment performance is minimum capacity required.
 - 9. Scheduled electrical capacity shall be considered as maximum available.

1.08 COORDINATION

- A. Coordinate Work in this Section with trades covered in other Sections of Specifications to provide a complete and operable installation of highest quality workmanship.
- B. Coordinate location of fire protection piping, mains and branches, to avoid interference with work by other trades. Plumbing drainage piping and ductwork shall have right-of-way over fire protection piping. Wherever conflicts exist, fire protection piping shall be offset or rerouted at no additional cost to Owner. Provide locations of piping for use in Coordinated Layout called for in Specification Section 23 80 00.
- C. Piping shall be concealed, except where so indicated or where absolutely necessary to be exposed. Exposed piping shall be placed as approved by Architect prior to installation. Heads shall be fully coordinated with architectural reflected ceiling plan and placed in center of ceiling tiles.
- D. On-site measurement of pipe will be required. Offsets, pipe, fittings, drains, etc., required to meet job conditions shall be furnished and installed at no extra cost to Owner.
- E. Additional heads required by NFPA 13 regulations shall be provided at no extra cost, if required as a result of Contractors' coordination. Location of heads and mains shall not be changed unless approved by Architect.

- F. Coordinate layout and installation of sprinklers with other construction penetrating ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- G. The Architect shall decide any differences or disputes concerning coordination, interference or extent of work, and his decision shall be final.

1.09 SUBMITTALS

- A. Samples: Provide one sample of each sprinkler head type.
- B. Shop Drawings: Submit in accordance with Division 01, and as follows:
 - 1. Prepare Drawings, calculations, and product data of fire protection systems indicating pipe sized, pipe locations, fittings, shutoffs, equipment, etc. Note, in bold type, any piping which will project beyond finished surfaces of normally occupied rooms, exterior of the building or other locations which will expose the system to view.
 - 2. Layout drawings and flow calculations approved by agencies having jurisdiction.
 - 3. Drawings and calculations shall be stamped and signed by a State of California licensed professional engineer prior to submission to the Architect. Engineer shall be qualified for this work.
- C. Manufacturer's data for each item of material or equipment used.
- D. Welding operator qualification certificates.
- E. Office of the State Fire Marshall (OSFM) certification cards for automatic fire extinguishing systems sprinkler pipefitters.
- F. Test Reports: As indicated in paragraph "Tests".
 - 1. Sprinkler pressure test.
 - 2. Standpipe pressure test.
 - 3. Alarm system test.
 - 4. Underground piping test.
- G. Operation and Maintenance Manual:
 - 1. Operation and Maintenance Manual in accordance with Section 21 00 50. Include an original copy of NFPA 25, California edition, in Operation and Maintenance Manual for fire sprinkler system.
 - 2. Guarantees in accordance with Division 01.
- H. Deferred Approval Documents: Do not proceed with fabrication or installation of fire sprinkler system until deferred approval documents have been approved by regulatory agencies.
 - 1. General: Provide detailed drawings, specifications, and calculations prepared by a State of California licensed professional engineer.
 - a. Documents produced by the Contractor shall be stamped and signed by the licensed mechanical engineer responsible for their preparation.
 - 2. Architect Review: Make additions, changes and corrections as directed by Architect and resubmit.
 - 3. Agency Review: Architect will submit documents to Agency or Authority Having Jurisdiction. Make additions, changes and corrections required by Agency / Authority at no cost to Owner and resubmit to Architect.
 - 4. Agency Approval: Architect will submit documents to Agency / Authority for final approval.

1.10 APPLICABLE PUBLICATIONS

- A. The following publications form a part of this specification:
 - 1. ANSI - American National Standards Institute.
 - 2. ASME - American Society of Mechanical Engineers.
 - 3. UL - Underwriters' Laboratories, Inc. Fire Resistance Directory.
 - 4. CBC - California Building Code.
 - 5. NFPA National Fire Protection Standards as amended by the CBC.
 - 6. CFC - California Fire Code.
 - 7. CPC - California Plumbing Code.

1.11 SUPERVISION

- A. Keep a competent superintendent on the job that shall coordinate the activities of the crafts and maintain the progress of the work to the satisfaction of the Architect.

1.12 SITE CONDITIONS

- A. Verify all dimensions at the building site and check existing conditions before beginning work. Make changes that are necessary to coordinate the work with other trades, after review by the Architect.

1.13 REGULATIONS

- A. All work shall be installed in strict conformity with California Building Code (CBC), California Plumbing Code (CPC), and California Electric Codes (CEC), Industrial Safety Orders, California Mechanical Code (CMC), California Fire Code (CFC), and other laws and regulations of authorities having jurisdiction.

1.14 FEES AND PERMITS

- A. Take out permits and pay fees and charges required in connection with the Work.

1.15 TEMPORARY CONNECTIONS

- A. Temporary connections required to maintain services during the course of the Contract shall be made without additional cost to Owner. The normal function of the building must not be interrupted; notify Owner minimum seven days in advance before interrupting any service.

PART 2 PRODUCTS

2.01 GENERAL

- A. The equipment to be furnished under this Specification shall be standard product of manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, component parts of system need not be products of the same manufacturer.

2.02 MATERIALS AND EQUIPMENT

- A. Unless otherwise shown on Drawings, specified, or directed by Architect, materials and equipment used in installation of sprinkler systems shall be listed as approved by FM or UL for fire protection systems, and shall be the latest design of the manufacturer.

2.03 SPRINKLER HEADS

- A. Provide spray pattern type sprinkler heads, of ordinary degree temperature rating, except that sprinkler heads for installation in vicinity of heating equipment, and in other areas noted on Drawings, shall have temperature ratings required for such locations by NFPA 13.
- B. Sprinkler heads shall be upright, pendent, or sidewall, as required.
 - 1. Heads in ceilings of occupied spaces with recessed lights shall be chrome plated, semi-recessed pendent type, with white escutcheon.
 - 2. Sprinkler heads in rooms with surface mounted lights shall be chrome plated pendant style, with two-piece white escutcheon.
 - 3. Provide head guards in equipment rooms and storage rooms and all other locations where subject to damage.
 - 4. Upright heads in areas with no ceilings shall be rough bronze finish.
 - 5. Provide quick response type heads in light and ordinary hazard occupancies.
 - 6. Side wall heads may be used (except in extended coverage type) to cover special areas where overhead piping and heads are impractical or a considered visual problem by the Architect or Owner. Side wall heads shall be chrome finish.
 - 7. Outdoor heads, if required shall be dry or freeze resistant.
 - 8. Adjustable drop nipples are not acceptable.

- C. Recessed sprinkler heads shall have chrome finish and adjustable chrome finish escutcheons; exposed pendent heads in finished ceilings shall have chrome finish and white ceiling escutcheons. Concealed (flush) heads shall be all brass, with white cover plate.
 - 1. Provide oversized escutcheons where required to meet the requirements of ASCE 7.
- D. Spare Heads: Furnish spare heads equal to one percent of total number of heads installed under Contract, but not less than twelve. Spare head types furnished shall be representative of types and temperature ratings of heads installed, and in proportion to number of each type and temperature rating of heads installed. Furnish not less than two sprinkler head wrenches, with at least one wrench for each type of sprinkler head installed. Place spare heads and wrenches in wall mounted box manufactured for this purpose.

2.04 PIPE AND FITTINGS

- A. For Installation Aboveground: 150 PSI, Schedule 40 black steel pipe, ASTM A-53 with ductile or cast iron screwed fittings.
 - 1. Schedule 10 black steel pipe, ASTM A 135 or ASTM A 795, with grooved fittings and associated couplings may be used for pipe sizes 2 inches through 5 inches. Provide NFPA 13-specified wall thickness for pipe sizes 6 inches through 10 inches. Threading of piping will not be accepted.
- B. For Installation Underground to 12 inches Above Ground:
 - 1. Pipe and fittings shall be approved for fire protection use.
 - 2. Underground Piping Outside Building: PVC Pipe: AWWA C900 or UL 1285, Class 200, with bell end with gasket, and with spigot end. PVC Fittings: AWWA C900 or UL 1285, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) Diamond Plastics Corporation.
 - 2) J.M. Eagle, Inc.
 - 3. Underground Piping Below Building Footing and Slab: One-piece, 304 stainless steel 90-degree fitting, with AWWA C900 bell-and-spigot gasketed inlet connection with lugs on inlet end, and AWWA C606 groove on outlet end, for connection to in-building riser using AWWA C606 grooved couplers and gaskets.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) Ames Fire and Waterworks, a Watts Water Technologies Company.
 - 2) Wilkins, a Zurn Company.
- C. Standpipes: Schedule 40 galvanized steel with 300 psi galvanized fittings.
- D. Mechanical tees, saddle fittings, bushings and mechanical sprinkler head fittings shall not be used.

2.05 ENCASEMENT FOR PIPING

- A. Standard: ASTM A674 or AWWA C105.
- B. Material: Linear low-density PE film of 0.008-inch minimum thickness.
- C. Form: Tube.
- D. Color: Natural.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Northtown Pipe Protection Products; Polywrap.

2.06 VALVES

- A. Angle, Check, and Globe Valves: Fed. Spec WW-V-51; Class A, type as suitable for application.
 - 1. Select check valves for installation in vertical lines recommended by manufacturer as suitable for vertical installation. Install in vertical lines only where flow is upward.
- B. Gate Valves:
 - 1. Sizes 1-1/2 inches or less: Fed. Spec WW-V-54, Class A.
 - 2. Sizes above 1-1/2 inches: Fed. Spec WW-V-58, Class A, designation OS or OF, as required. Provide OS&Y type, 175 pound rated working pressure.
 - 3. Furnish and deliver to Owner one wrench of each size required for operating underground valves.
- C. Drain Valves: angle, or globe. Fed. Spec WW-V-51; Class A, type as suitable for application.
 - 1. UL listed and FM approved combination test and drain fittings may be used.
- D. Zone Control Valves: UL listed, outside screw and yoke or butterfly. Valves shall be sealed open with approved seal. Provide weatherproof actuator housing, with two single pole, double throw switches.
 - 1. Supervisory Switch: Fit the control valves on the fire sprinkler risers with supervisory switch, with single pole double throw switch actuator installed to change switch position when valve is being closed.
- E. Sprinkler Inspector's Test Fittings:
 - 1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - 2. Pressure Rating: 175-psig minimum.
 - 3. Body Material: Cast- or ductile-iron housing with sight glass.
 - 4. Integral factory or field-installed pressure relief valve.
 - 5. Size: Same as connected piping.
 - 6. Inlet and Outlet: Threaded.

2.07 FIRE HYDRANT

- A. Dry barrel or wet barrel, as required by local fire district, with 5 inch minimum diameter, 36 inch bury, two 2-1/2 inch hose nozzles, one 4-1/2 inch pumper nozzle, installed in accordance with manufacturers requirements.
 - 1. Manufacturer and installation of hydrant shall conform to standards of the local authority. Hydrant and fire line shall comply with NFPA 24.
 - 2. Hydrant shall conform to, and installation shall comply with the requirements of the local Department of Public Works, and the requirements of the local fire district. Confirm the required color of hydrants prior to installation.

2.08 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

- A. Provide reduced-pressure principle backflow preventer assembly, including shutoff valves on inlet and outlet, and strainer on inlet, equal to Febco 860 or 880, as required. Backflow preventer shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.
- B. Provide minimum 13 gage one or two piece expanded metal backflow preventer enclosure, sized to suit size of backflow preventer. Furnish with mounting hardware and provision for locking enclosure in closed position. Install on concrete pad, in accordance with manufacturer's installation instructions.
 - 1. Manufacturer: Subject to compliance with requirements and local fire and water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. LeMeur Welding and Manufacturing: BF series.
 - b. Backflow Protection Co.: Ultimate Tuff Cage.
- C. Provide padlock and chain to lock valves in open position, and give key to Project Inspector.
 - 1. Padlocks shall be as specified under Section 08 70 00.

2. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 linear feet. Chain shall be hot galvanized.
- D. Provide capped connections at each test cock. Install in accordance with requirements of authority having jurisdiction.
- E. Provide water flow alarm switch at each main valve. Arrange to provide alarm if valves are closed.
- F. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.
- G. Provide two concrete filled, 6-inch diameter pipe bollards to protect exposed piping from motor vehicle damage.
- H. Manufacturer: Subject to compliance with requirements and local fire and water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 1. Ames Fire and Waterworks: A division of Watts Water Technologies, Inc.
 2. Febco: A division of Watts Water Technologies, Inc.
 3. Watts Water Technologies, Inc.
 4. Wilkins: A Zurn Company.
 5. Conbraco Industries, Inc.

2.09 DOUBLE CHECK DETECTOR VALVE BACKFLOW PREVENTERS

- A. Provide double detector check valve assembly consisting of two spring loaded brass check valves, two cast iron bronze fitted gate valves and four test cocks, equal to Febco Model 856 or 876 as required. Construct in accordance with ASSE Standard 1048.
- B. Provide minimum 13 gage one or two piece expanded metal backflow preventer enclosure, sized to suit size of backflow preventer. Furnish with mounting hardware and provision for locking enclosure in closed position. Install on concrete pad, in accordance with manufacturer's installation instructions.
 1. Manufacturer: Subject to compliance with requirements and local fire and water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. LeMeur Welding and Manufacturing: BF series.
 - b. Backflow Protection Co.: Ultimate Tuff Cage.
- C. Provide padlock and chain to lock valves in open position, and give key to Project Inspector.
 1. Padlocks shall be as specified under Section 08 70 00.
 2. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 linear feet. Chain shall be hot galvanized.
- D. Provide water flow alarm switch at each main valve. Arrange to provide alarm if valves are closed.
- E. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.
- F. Provide capped connections at each test cock. Install in accordance with requirements of authority having jurisdiction.
- G. Provide two concrete filled, 6 inch diameter pipe bollards to protect exposed piping from motor vehicle damage.
- H. Manufacturer: Subject to compliance with requirements and local fire and water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 1. Ames Fire and Waterworks: a division of Watts Water Technologies, Inc.
 2. Febco: a division of Watts Water Technologies, Inc.
 3. Watts Water Technologies, Inc.

4. Wilkins: a Zurn Company.
5. Conbraco Industries, Inc.

2.10 WATER FLOW ALARM SWITCH

- A. UL listed water flow alarm switch suitable for variable pressure, complete with instantaneous recycling retard and two single pole double throw electrical contacts. Provide continuously monitored water flow alarm switch and trouble sensor, automatically transmitted to an approved control alarm station.

2.11 FIRE DEPARTMENT CONNECTION

- A. Post mounted, complying with Local Fire Marshal standards cast brass two-way inlet body with drop clappers. Furnish with two brass double female snoots with rigid end N.P.T.X. pin lug house thread swivels, plugs and chain.
- B. Provide check valve in piping between inlet connection and fire protection system. Provide ball drip at low point of piping, below grade on the inlet side of the check valve, and drain to gravel sump. Provide gravel sump with minimum 3 cubic feet of course gravel.

2.12 POST INDICATOR VALVE

- A. Mueller, American Cast Iron Pipe Co., or equal, UL-listed; provide handle lock and water flow alarm switch.

2.13 ANTIFREEZE SYSTEMS

- A. Provide dry pipe, preaction, or antifreeze systems for all portions of the fire protection system installed outside or in areas that cannot be maintained above 40 degrees F.
- B. Dry pipe, preaction, or antifreeze systems shall be installed, labeled, and tested in accordance with NFPA 13.
- C. Where solution based antifreeze systems are installed, Contractor shall provide antifreeze solution with a freezing point of minus 26 degrees F. or lower. Provide antifreeze test kit and adequate instructions for testing concentration and freeze point.

2.14 UNION AND FLANGES

- A. Size and Type:
 1. Steel 2 inches and smaller: 150 pound screwed black or galvanized malleable iron, match pipe, ground joint, brass to iron seat.
 2. Steel 2-1/ inches and larger: 150 pound black flange union, flat faced, full gasket.
- B. Gaskets: 1/16 inch thick rubber Garlock #122, Johns-Manville, or equal.
- C. Flange Bolts: Open hearth bolt steel, square heads, with cold pressed hexagonal nuts, cadmium plated when installed below ground. Provide copper plated steel bolts and nuts or brass bolts and nuts for brass flanges.

2.15 GAUGES

- A. Marsh "Quality Gage", U.S. Gage, Danton 800, or equal, U.L. listed, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at midscale. Provide a three-way valve on each gauge connection.

2.16 SEISMIC SEPARATION ASSEMBLY

- A. Provide seismic separation assembly as defined in NFPA 13 at locations where piping crosses building seismic joints and at locations where required to prevent pipe breakage due to building movement.
 1. At Contractors option, provide Metraflex "Fireloop" UL listed assembly, or equal at each seismic joint location, in lieu of seismic separation assembly.

2.17 PREACTION (DRY) TYPE SPRINKLER SYSTEM

- A. For installation downstream of preaction valves: Schedule 40 galvanized black steel, ASTM A 53 with galvanized gray-iron threaded fittings.

1. Schedule 10 galvanized black steel pipe, ASTM A 135 or ASTM A 795, with roll-grooved ends and galvanized fittings and associated couplings may be used for pipe sizes 2 inches through 5 inches. Provide NFPA 13-specified wall thickness for pipe sizes 6 inches through 10 inches. Threading of Schedule 10 galvanized black steel piping will not be accepted.
- B. Air piping for dry pipe charge shall be same as item "A" above for pre-action piping.
- C. Pre-action Valve: Vertical pattern or angle pattern; deluge type; accessories per NFPA Standards; shall include a top-loaded pneumatically closed valve, and include check valve functions. Pre-action accessories shall include a magnetically operated vent valve, actuated only by temperature detector to fill system with water. Pneumatic-hydraulic release systems are not acceptable. When the pre-action valve opens, it shall actuate fire alarm system. Provide a pressure gauge on each side of pre-action valve.
- D. Supervisory air system shall be provided for distribution piping, including an air compressor, and an air pressure sensor to activate an alarm if air pressure is lost through fusing of a head.
- E. Air Maintenance Device: In compressed air piping to the pre-action dry pipe system; Grinnell No. F-320, Central Model DU-2, or equal, downstream pressure setting as required by MFG with supply check, relief and drain valves per NFPA Standard.
- F. Solenoid Valve: ASCO Series 8210 general purpose two-way normally closed solenoid valve; brass body, Band "N" seating, 24V DC; UL listed, J.D. Gould Company, or equal.
- G. In lieu of above individual components, Contractor may use Viking "Totalpac" single interlocked pre-action system, or equal.

PART 3 EXECUTION

3.01 GENERAL

- A. Installation of the sprinkler system shall not be started until complete plans and specifications (including water supply information and type of existing sprinkler system, if any) have been approved by the State Fire Marshal.
 1. Piping shall be concealed unless shown or otherwise directed.
 2. Where piping is left exposed within a room, it shall be run true to vertical, horizontal or intended planes. Where possible, uniform margins shall be maintained between parallel lines and/or adjacent wall, floor or ceiling surfaces.
 3. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for maximum headroom clearance. This clearance shall not be less than 6'-6" without written approval from Architect.
 4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by Architect at no additional cost to Owner, providing such change is ordered before such items of work, or work directly connected to same, are installed and providing no additional material is required.
 5. Grade all piping as required by NFPA 13.
 6. Close ends of pipe immediately after installation; leave closure in place until removal is necessary for completion of installation.
 7. Piping systems shall be thoroughly flushed and proved clean before connection to equipment.
 8. Pipe discharge of each drain valve to floor sink or drain.

3.02 HANGER AND SUPPORT INSTALLATION

- A. General: Support piping so that it is firmly held in place by approved iron hangers and supports and by special hangers as required in accordance with NFPA 13. Hangers shall support loads specified in NFPA 13, and, in addition, shall support weight of pipe, fluid and pipe insulation, based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments, or hangers, shall be of same size as pipe or tubing on which used, or nearest larger size available. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS)

Standard Practice SP-58, provide branch line restraints where hangers exceed 6 inches long, in accordance with NFPA 13. Install concrete anchors required. Hanger material shall be approved by Architect before installation. Do not support piping by plumbers' tape, wire, rope, wood or other makeshift devices.

- B. Suspend rods from angle clips, in accordance with Section 21 00 50.

3.03 SEISMIC REQUIREMENTS

- A. Comply with CBC, Volume 2, Chapter 16A and CBC Chapter 9 and NFPA 13.
- B. Seismic bracing system shall be a complete pre-engineered bracing system. Pre-engineered bracing system shall include plan layout, brace selection, specification, and calculations. Complete system shall be submitted to Architect for review. See Delegated Design Submittal paragraph in article, Submittals, in Section 21 00 50.
- C. Anchorage for various manufactured and fabricated items is detailed and scheduled on the drawings or specified.
 - 1. For proposed changes to anchorage shown, or specified, submit proposed methods of anchorage with calculations prepared by a California Registered Structural Engineer. Design of anchorage shall comply with the above regulations using minimum coefficients, CP, listed CBC Chapter 16A.
- D. It is not intended that prototype or non-standard equipment or equipment frames be provided. However, items of equipment shown or specified to be anchored shall maintain integrity at point of anchor after being subjected to accelerations equivalent to those established herein.
- E. Anchors: Piping shall be provided with anchors for protection of piping against damage due to earthquakes, as required by CBC Chapter 16A, NFPA 13, and other sections of this Specification.

3.04 TESTS

- A. At various stages and upon completion, the system must be tested in the presence of the enforcing agency.
- B. Upon completion and prior to acceptance of the installation, subject entire new system to tests required in NFPA 13, and furnish Owner with certificates as appropriate.

3.05 IDENTIFICATION

- A. Coordinate requirements with the authority having jurisdiction.
- B. Provide brass valve tags at each system valve, indicating valve service.
- C. Provide signage at each sprinkler valve, with sign indicating specific portion of system controlled by valve.
- D. Provide signage at each outdoor alarm device, with sign indicating which authority to call if device is activated.
- E. Prior to final acceptance, Contractor shall provide accurate color-coded Building Plan at riser location, clearly depicting fire protection system area of coverage, location of inspectors' test/drain connection and auxiliary drain connections. Provide this information at each system or building at riser location for building. Plan(s) shall be one-half size and plastic laminated.
- F. Provide hydraulic data signage permanently attached to risers, indicating location, basis of design, water supply and pressure requirements of system.

3.06 ELECTRICAL WIRING

- A. Coordination of wiring systems is part of this work. Contractor shall ensure that the following is completed.
 - 1. Work provided in other Specification Sections:
 - a. Supervised wiring to fire alarm control panel.
 - b. Supervised wiring from main waterflow indicator to fire alarm panel.
 - c. Supervised wiring from sprinkler flow switches to fire alarm panel.

- d. Supervised wiring from valve water flow alarm switches to fire alarm panel.
- 2. Work provided in this Specification Section:
 - a. Wiring diagrams for devices.
 - b. Other wiring not specified to provide an operating system.

3.07 SPRINKLER HEAD INSTALLATION

- A. Heads shall be placed upright where on exposed piping, unless otherwise noted, and in pendant position on concealed piping, unless noted otherwise, with deflectors parallel to the ceiling or roof slope. Clearance between deflectors and ceilings, electric, or heating equipment, or other obstruction shall be in accordance with the requirements of NFPA 13. Provide sprinkler head guards where heads are subject to mechanical damage, for example, at mechanical rooms, and storage rooms and gymnasiums.
- B. Mount box containing spare sprinkler heads and wrenches on wall in location selected by Owner.
- C. Do not install pendant sprinkler heads until flushing of piping has been completed.
- D. Provide return bend as illustrated in NFPA 13 (NFPA exceptions do not apply) for each sprinkler head installed in finished ceiling.

3.08 PIPING INSTALLATION

- A. Pipe shall be assembled in accordance with the applicable requirements of NFPA 13 and NFPA 24.
- B. Install pipe encasement on underground and under-slab metal piping.
- C. Provide concrete thrust blocks for underground and underslab piping in accordance with NFPA 24 and CBC.

3.09 VALVE IDENTIFICATION

- A. All valves shall be identified by permanent metal tags or other approved means.

3.10 DRAIN INSTALLATION

- A. Auxiliary drains shall be installed on low points in each system.
 - 1. Five or fewer trapped gallons will not require a drain valve but may be drained through a plugged fitting. Drain valves shall be in accordance with the requirements of NFPA 13.
- B. Install one inspector's test drain on sprinkler system. Extend drain to outside in location approved by Architect. Water discharge shall be positioned such that landscaping will not be damaged.
- C. Drain valves shall be piped to a safe place of discharge and discharge shall be visible either by open-end drainpipe or sight drain fitting.
- D. Provide flushing connections at ends of cross-mains.

3.11 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers where indicated on Drawings. Provide available manufacturers drain connection, pipe drain outlet to nearest floor sink or drain.
 - 1. Where drain pans are shown on Drawings, pipe drain pan outlet to nearest floor sink or drain.

3.12 SLEEVE INSTALLATION

- A. Install AMI Products, Adjus-to-Crete, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
- B. At walls below grade Link-Seal casing seals, or equal, may be used in lieu of caulking. Pipes penetrating walls below grade shall be anchored at wall.

3.13 FLOOR, WALL, AND CEILING PLATE INSTALLATION

- A. Fit pipes with or without insulation passing through walls, floors, or ceilings and hanger rods penetrating finished ceilings with chrome plated or stainless steel plates.

3.14 FIRESTOPPING

- A. The annular space between pipe sleeves and pipe passing through all floors and walls shall be packed with incombustible mastic or other suitable material, in accordance with U.L. Fire Resistance Directory.
- B. Penetrations in fire rated assemblies shall also be protected in accordance with CBC Chapter 7, Section 712, and UL Fire Resistance Directory.

3.15 UNION AND FLANGE INSTALLATION

- A. Install unions whether shown or not at each connection to equipment and at one connection to each valve or cock.
- B. Locate the unions for easy removal of the equipment or valve.

3.16 CLEANING

- A. Upon completion of tests, clean equipment, piping, etc., installed under this Section of the Specifications.

3.17 PIPING SYSTEM FLUSHING

- A. Entire system shall be flushed out and cleaned after completion of piping, and prior to installation of sprinkler heads. Flush shall be continued until water runs clear at drain connections.

3.18 ANTIFREEZE SYSTEM INSTALLATION

- A. Install antifreeze systems at the following locations and as noted on Drawings.
 - 1. Location: where required to meet NFPA 13, and/or Part 2 Paragraph (above) titled "ANTI FREEZE SYSTEMS".
- B. Install antifreeze loops in accessible areas, and provide adequate signs providing instructions on maintenance of the system. Obtain approval of antifreeze loop location from Architect prior to any construction work.

3.19 PRE-ACTION SYSTEM INSTALLATION

- A. Function of System: Conform to requirements of NFPA 13 and the following:
 - 1. The single interlocked pre-action system shall utilize a detector system and pressurized air in sprinkler piping.
 - 2. The system shall utilize deluge valve and be arranged so that deluge valve will open only when there is operation of detection system.
 - 3. If detection system operates due to fire, damage or a malfunction, deluge valve shall open.
 - 4. If sprinkler piping is damaged or sprinkler is broken or fused, deluge valve shall not open.
 - 5. The operation of a detector (or release) shall be required before deluge valve will open, allowing water to enter system piping.
 - 6. Provide system override to allow deluge valve operation should detection system be rendered inoperative.

END OF SECTION

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SECTION 22 04 00

PLUMBING

PART 1 - GENERAL

1.01 SUMMARY:

- A. The "Mechanical General Provisions," Section 230000 is a part of this section and applies as fully as if repeated herein.
- B. The work under this section includes everything necessary for and incidental to executing and completing the plumbing work, except as hereinafter specifically excluded. All work shall include up to 5 feet outside of the building unless noted otherwise on the drawings.
- C. Work included shall be as indicated on the drawings, including but not limited to the following:
 - 1. Sanitary Soil, Waste and Vent System.
 - 2. Domestic Water System including Water Heater.
 - 3. Storm Drain System.
 - 4. Plumbing Fixtures and Equipment.
 - 5. Fuel Gas System.
 - 6. Condensate Drain System for HVAC Equipment.
 - 7. Sterilization and Tests.
 - 8. Compressed Air System.
- D. Work not included:
 - 1. Cutting and blocking of structure for fixtures and piping.
 - 2. Forming and pouring of concrete for housekeeping pads.

1.02 GENERAL REQUIREMENTS:

- A. Reference to Other Sections: The applicable requirements from the following specification sections shall form a part of the plumbing work and the Contractor shall consult them in detail for general and specific requirements:

Section	230000	Mechanical General Provisions.
	233000	Heating, Ventilating and Air Conditioning.

1.03 ENERGY CONSERVATION:

- A. Based on the latest edition of the *California Energy Commission* (CEC), the work will comply as follows:
1. The plumbing system equipment and fixtures shall meet the fuel type, input, volume, and quantity that are identical to the proposed design. The standard design shall assume recovery efficiency or thermal efficiency and standby loss as specified in Sections 111 or 113 of the *Building Energy Efficiency Standards*.
 2. Insulation for unfired hot water storage tanks shall meet Title 24 requirements.

PART 2 – PRODUCTS

2.01 INSULATION:

- A. Domestic hot water piping, hot water return piping, and 8 feet of cold water pipe at the water heating equipment shall be Johns-Manville, Certain-Teed, Owens Corning, or equal fiberglass with pressure sensitive closure system jacket. The conductivity range of the insulation shall be 0.22-0.28 BTU-IN/HR-SF-⁰F with a mean temperature rating of 105⁰F - 140⁰F. See table below for thickness of insulation:

Runouts	Less than 1"	1" and larger
1"	1"	1½"

- B. The insulation shall be applied over clean, dry pipe with all joints butted firmly together. The factory-attached tape shall be pasted smoothly over the insulation.
- C. Fittings shall be insulated with Manville Products #301 cement to a thickness equal to the adjoining pipe insulation and finished with 4-oz. canvas pasted on or finished with "Zeston" premolded PVC insulated fittings.
- D. Where piping is exposed to view, factory-applied 6-oz. canvas jacket or PVC jacketing shall be installed.
- E. Water supply and drain piping below accessible lavatories and sinks, unless the installation configuration protects the user against contact, shall be insulated with Handy Shield safety covers by Plumberex Specialty Products, Truebro Lav-Guard, Zurn, or equal.
- F. Condensate piping, condensate overflow piping, and sewer piping above grade receiving cold condensate within building shall be insulated with JM Rubatex by RBX Industries, Owens Corning, Armacell, or equal.

2.02 FITTINGS AND PIPING:

A. Soil, Waste, Vent, and Rainwater Piping Within the Building:

1. Above Grade:

- a. PVC Schedule 40 solid wall pipe and PVC DWV fittings may be used in buildings without a return air ceiling plenum and as permitted by code. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785 and ASTM D 2665. Fabricated PVC DWV fittings shall conform to ASTM F 1866. All systems shall utilize a separate waste and vent system. System shall be reviewed and approved by E.O.R. before inclusion of PVC in a bid.
- b. At space limitations and waste pipe over watertight areas, use DWV copper drainage tubing with cast brass fittings.

2. Below Grade:

- a. PVC Schedule 40 solid wall pipe and PVC DWV fittings may be used in buildings without a return air ceiling plenum and as permitted by code. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785 and ASTM D 2665. Fabricated PVC DWV fittings shall conform to ASTM F 1866. All systems shall utilize a separate waste and vent system. System shall be reviewed and approved by E.O.R. before inclusion of PVC in a bid. PVC Schedule 40 solid wall pipe and PVC DWV fittings may be used as permitted by code and local jurisdiction (when noted on plans only).

B. Sewer and Storm Drain Piping from 5-feet Outside Building: PVC sewer pipe JM "Greenbell" as manufactured by Manville Products or cast iron no-hub conforming to CISPI 301 with neoprene gasket and 300 series stainless steel clamping device conforming to CISPI 310.

C. Domestic Water Piping:

1. Above Grade: Lead free Type L copper tubing hard drawn. Pipe manufacturers shall be Mueller Industries, Cambridge-Lee Industries, Cerro Flow Products, or equal.
 - a. Lead free wrought copper solder sweat fittings and lead-free solder. Fitting manufacturers shall be Elkhart Products Corporation, Mueller Industries, Nibco, or equal.
2. Below Grade: Lead free Type K copper tubing annealed, straight lengths with lead free wrought copper solder sweat fittings and lead-free solder. Pipe manufacturers shall be Mueller Industries, Cambridge-Lee Industries, Cerro Flow Products, or equal. Fitting manufacturers shall be Elkhart Products Corporation, Mueller Industries, Nibco, or equal.

D. Condensate Piping: Type "M" copper tubing, hard drawn with wrought copper or cast brass fittings, and lead free solder joints. Pipe manufacturers shall be Mueller Industries, Cambridge-Lee Industries, Cerro Flow Products, or equal. Fitting manufacturers shall be Elkhart Products Corporation, Mueller Industries, Nibco, or equal.

E. Indirect Waste Piping: Type DWV copper drainage tubing with cast brass fittings.

F. Fuel Gas Piping:

1. Above Grade:

- a. 2½" and Smaller: Schedule 40 ASTM A53 galvanized steel screwed pipe, with black banded Class 150 malleable iron threaded fittings.
- b. 3" and Larger: Schedule 40 ASTM A53 galvanized steel screwed pipe, with factory made wrought steel butt welded fittings.
- c. All outdoor, exposed and exterior piping and fittings shall be ASTM A53 Zinc-coated galvanized.
- d. Exposed pipe shall be labeled every five linear feet.
- e. Pipe manufacturers shall be Wheatland Tube Company, American Piping Products, Valencia Pipe Company, or equal. Fitting manufacturers shall be Anvil International, Ward Manufacturing, Hayward Pipe & Supply, or equal.

2. Below Grade:

- a. Polyethylene (PE) IAPMO approved for gas piping with butt fusion joints and fittings conforming to SDR-11 PE2306 CD ASTM. Label pipe "Gas Piping."
- b. Pipe manufacturers shall be Chevron Phillips, Uponor, JM Eagle, or equal.

G. Gas flue pipe and fittings shall be Metalbestos or equal, double wall design approved for the connected appliance; provide complete with spacers, roofjacks and raincap.

H. Compressed Air Piping:

- 1. Above grade, Type "L" copper tubing hard drawn with wrought copper solder sweat fittings.
 - a. Wrought copper or cast bronze grooved end fittings, manufactured to copper tube dimensions. (Flaring of fitting ends to IPS dimensions is not allowed.)
 - b. Alternate: Grooved joint couplings consisting of two ductile iron housing segments cast with offsetting angle-pattern bolt pads, grade EHP or Nitrile gasket, and ASTM A449 compliant bolts and nuts. Installation-Ready, for direct stab installation without field disassembly. Option: Victaulic Style 607.

2.03 PIPING SPECIALTIES:

- A. Unions: In copper tubing 3" and smaller, Lead free Nibco 733-LF, Elkhart Products Corporation, or equal.
- B. Flanges in copper tubing 4" and larger, Lead free, Nibco, or equal.
- C. Isolation Unions: Wilkins lead free DUxLC, Watts, Zurn, or equal for sizes 3" and smaller.
- D. Water hammer arresters in accordance with PDI-WH-201 standards, JR Smith 5000 series, Precision Plumbing Products, Zurn, or equal. Install with access panel.

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

- A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- B. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.02 RELATED DOCUMENTS

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

1.03 SECTION INCLUDES

- A. Wood doors.

1.04 RELATED SECTIONS

- A. Section 08 11 13 – Hollow Metal Doors and Frames.
- B. Section 08 71 00 – Door Hardware.
- C. Section 08 80 00 - Glazing

1.05 QUALITY ASSURANCE

- A. Standards:
 - 1. Woodwork Institute, "Manual of Millwork", latest edition.
 - 2. Product Standard, PS-32.PS-32.
 - 3. WDMA I.S. 1A-Window and Door manufacturers Association.
 - 4. Architectural Woodwork Institute (AWI), Section 1300 and 1500B.
 - 5. National Fire Protection Association (NFPA).
- B. Comply with applicable accessibility criteria (e.g. ADA, CBC Chapter 11B).
- C. Qualifications of Manufacturer: All wood doors shall bear the NWMA seal of approval and I.S. 1 stamp.
- D. Submit Certification indicating that the product meets the requirements of NFPA 80 for Fire Rated Doors. All doors shall be the product of the same manufacturer to ensure uniformity of quality and appearance throughout the project.
- E. Provide each fire rated door with a label permanently attached to either the hinge stile or to the top rail, showing testing agency approval for classification scheduled
- F. The top of each door shall bear a label from the manufacturer indicating the door construction, face veneer species, cut and grade. If the doors are factory finished the label shall also have the finishing information.
- G. G. The Door Manufacturer shall provide a letter, signed by an authorized company representative, to the Architect stating that the doors have been manufactured in compliance with this specification.

1.06 SUBMITTALS

- A. Submit per the provisions of Section 01 30 00 – Submittals.
- B. Submit to scale shop drawings indicating general construction jointing methods, hardware locations, and locations of cut-outs for glass and louvers.
- C. Submit manufacturer's product literature for materials provided.
- D. Samples: submit 2"x10" veneer samples of specified veneer with the specified finish. Samples are to be submitted representing the color selected on veneer typical of grain patterns and coloration for the specified species and cut.

1.07 PRODUCT HANDLING

- A. No doors shall be delivered to the building until weatherproof storage space is available. Store doors in a space having controlled temperature and humidity range between 30 and 60 percent. Stack doors flat and off the floor, supported to prevent warping. Protect doors from damage and direct exposure to sunlight.
- B. Factory finished doors shall be individually wrapped in polybags to protect the finish from damage by contact with other doors.
- C. Do not walk or place other material on top of stacked doors. Do not drag doors across one another.
- D. Contractor shall use all means necessary to protect doors from damage prior to, during, and after installation. All damaged doors shall be repaired or replaced by the contractor at no cost to the owner.
- E. Doors shall be palletized at factory in stacks of no more than 30 doors per pallet. Door edges shall be protected with heavy corner guards.
- F. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

1.08 WARRANTY

- A. All work in this Section shall be warranted by a FULL DOOR WARRANTY (from the date of Substantial Completion) against defect in materials and workmanship, including the following:
 - 1. Delamination in any degree.
 - 2. Warp or twist of 0.3-inches or more in any 3'-6" x 7'-0" section of a door.
 - 3. Telegraphing of any part of core assembly through face to cause surface variation of 1/100-inch or more in a 3-inch span.
 - 4. Any defect which may, in any way, impair or affect performance of the door for the purpose which it is intended. Replacement under this warranty shall include hanging, installation of hardware, and finishing.
- B. Periods of warranty after date of installation for Interior solid core and mineral core shall be as follows:
 - 1. Material: Lifetime warranty.
 - 2. Labor: One (1) year warranty.
- C. Doors must be stored, finished, hung, and maintained per manufacturer's recommendations.

1.09 COORDINATION

- A. Contractor shall be responsible for coordination and acquiring of all necessary information from hardware and metal frame manufacturers. Door manufacturer shall be responsible for coordinating all necessary information received by Contractor from hardware and metal frame manufacturers, in order that doors shall be properly prepared to receive hinges and hardware. Contractor shall provide his supplier with two copies of approved frame schedule, two copies of hardware schedule, and all necessary hardware templates.

PART 2 – PRODUCTS

2.01 DOORS

- A. Doors shall conform to the drawings and Door Schedule and shall be of the size, thickness, and type indicated.
 - 1. All doors and panels, unless noted otherwise on drawings or specified otherwise herein, shall be fit to hollow metal frames on site. Take accurate field measurements of hardware mortises in frames to verify dimensions and alignment before proceeding.
- B. Solid core, flush wood doors shall be manufactured in accordance with the foregoing referenced standards, WIC grade as indicated, 5-plywood veneer door by Forte Opening Solutions, Marshfield Door Systems, Haley Architectural Wood Doors, Algoma, or equal.
 - 1. Interior Doors: White Birch stained, Rotary cut, WMDA grade 1 (premium) grade faces for semi-transparent stain finish, unless otherwise indicated.

- a. Doors shall be pre-finished in color as noted on the finish schedule.
 - b. Factory finish doors in accordance with WDMA G-17 Finish System Description or AWI Division 1500–S-4 – Finish System Standards. Factory finish to be water-based stain and ultraviolet (UV) cured polyurethane to comply with EPA Title 5 guidelines for Volatile Organic Compound (VOC) emissions limitations.
2. Only particle board core doors shall be used. Hollow core, wood stave, mineral core, honeycomb, or other similar types of cores are not acceptable.

2.02 HARDWARE

- A. Finish hardware is specified in Section 08 71 00 – Door Hardware.

2.03 FRAMES

- A. Door frames are specified in Section 08 11 13 – Hollow Metal Doors and Frames.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Installer must examine door frames and verify that frames are correct type and have been installed as required for proper hanging of corresponding doors. Notify Contractor in writing of conditions detrimental to proper and timely installation of wood doors. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to installer.
- B. Verify all fire-rated doors are rated and located correctly, per the plans.

3.02 INSTALLATION

- A. Condition doors to average prevailing humidity in installation area prior to hanging.
- B. Hardware: For installation requirements refer to Section 08 71 00 – Door Hardware.
- C. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and as shown.
- D. Clearance: Unless indicated otherwise, for non-rated doors provide clearances of 1/8-inch at jambs and heads; 1/8-inch at meeting stiles for pairs of doors; and 1/4-inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch clearance from bottom of door to top of threshold.

3.03 FINISHING

- A. All doors are to be factory finished.
- B. Stain, if required, to be selected from manufacturer's standard colors if possible, or custom matched to Architects sample. Top and bottom of the doors to be sealed.
- C. Doors to be individually enclosed in a polybag after finish is fully cured.

3.04 ADJUST AND CLEAN

- A. Operation: Rehang or replace doors which do not swing or operate freely, as directed by Architect.
- B. Refinish or replace doors damaged during installation, as directed by Architect.
- C. Protection and Completed Work: Protect installed wood doors from damage or deterioration until acceptance of work.

END OF SECTION

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- E. Floor drain trap primers:
1. Trap Primer: Precision Plumbing Products, Inc. (PPP) "Prime-Rite" Model PR-500 automatic floor drain trap primer valve with corrosion resistant fittings and copper reservoir, Watts, Mifab, or equal. Install PPP floor drain trap primer distribution unit DU-U Series as required. Install with access panel.
 2. Trap Primer: Sloan VBF-72-A1 PPP FVP-1VB (for use with flush valve water closet).
- F. Gas Flexible Connector: BrassCraft, Watts, T&S Brass, or equal, one piece construction, uncoated Type 304 stainless steel, cadmium-plated steel flare nuts, and fittings.
- G. Fixture Supplies: Flexible stainless steel braided, compression fittings, BrassCraft, T&S Brass, Sioux Chief, or equal.
- H. Tracer Wire: Provide on all buried plastic pipe No 10 AWG, TW insulated copper wire, Wal-Rich Corporation, Copperhead Industries, Priority Wire & Cable, or equal. Spiral wrap around complete length of all buried plastic piping at approximately 2' intervals terminate above grade.
- I. Buried Utility Warning Tape: 6" wide plastic labeled buried utility warning tape, Seton, Brady, Harris Industries, or equal. Tape shall be labeled with the appropriate service. Provide above all buried piping 5' – 0" outside of the building.
- J. Strainers 3" and Smaller: Lead free 250 lb., W.W.P., cast bronze, screwed, "Y" Pattern, 20 mesh, S.S. screen; Wilkins SXL100 Series, Watts, Armstrong or equal.
- K. Escutcheons: 1" wide chrome or nickel-plated rust resistant.
- L. Pipe labels and valve tags shall be manufactured by W.H. Brady, Seton, Emedco or equal.
- 2.04 VALVES:
- A. Water:
1. Ball Valves: Bronze 2 Piece, full port, lead free ANSI/NSF 372 certified sizes ½" through 2" Nibco T-585-80 LF/S-585-80LF, Apollo #77CLF, Milwaukee Valve UPBA400 (FNPT)/UPBA450 (sweat), or equal, full port, bronze lead free, or legend #T/S 901.
 2. Gate Valves: Bronze class 125 lead free ANSI/NSF 372 certified sizes 1 ½" shall be Nibco, S/T-113-LF, Milwaukee Valve UP105 (FN Sizes 3" and larger Nibco F603RW, or Legend TIS-415, or equal.
 3. Check Valves:
 - a. Silent check, 2-½" and smaller: Lead free ANSI/NSF 372 certified class 125, bronze, Y-Pattern, horizontal swing, renewable disc, threaded or solder; Nibco T/S-413-Y-LF series, Milwaukee Valve UP509 (FNPT)/UP1509 (Sweat) (Bronze Disc), Apollo, or equal.

4. Balancing Valves: Lead free bronze body/brass ball construction with glass and carbon filled TFE seat rings. Valves to have differential pressure read-out ports across valve seat area. Read-out ports shall be fitted with internal EPT inserts and check valves. Valve bodies to have 1/4" NPT tapped drain/purge port. Valves to have memory stop feature to allow valve to be closed for service and then reopened to setpoint without disturbing balance position. All valves to have calibrated nameplates to assure specific valve settings. All valves shall be provided with strainer, molded insulation to permit access for balance and readout. ITT Bell and Gossett CB series, TACO, Watts, or equal.
 5. Stops: Lead free angle or straight valve loose key with escutcheon at wall penetration. Stop and escutcheon shall be chrome plated T&S Brass, Nibco, BrassCraft, or equal.
 6. Thermostatic Mixing Valve: Lead free under counter mixing valve for lavatory faucets, thermostatic tempering, one valve to serve one to four faucets equal to Symmons.
 7. Master Tempering Valve and Automatic Balancing Valve System: Master tempering valve shall be constructed of solid brass with triple duty check stops and balancing poppet design, minimum flow rate of 0.5 gpm, adjustment range of 40°F to 160°F, and feature minimum flow control to ASSE 1017. Automatic balancing valve assembly with temperature/pressure gauges, flow meter, volume control, and in-line check valves, Leonard, Powers, Symmons, or equal.
- B. Combination pressure and temperature relief valve: With minimum 3" extension, Wilkins, Watts, Apollo, or equal, sized for proper pressure relief setting and BTU rating.
- C. Gas Cocks:
1. 2" and Smaller: 125 PSI W.O.G., bronze body, square head, bronze plug and washer, Nibco, Hammond, Milwaukee Valve, or equal.
- D. Reduced Pressure Backflow Preventer (RPBFP): Lead free 175 PSI at 140°F, bronze body, celcon check seats, stainless steel relief valve seats, bronze body ball valve test cocks, nonrising stem gate valves (threaded for 3/4" through 2" and flanged for 2-1/2" through 10"), air gap drain fitting (route drain to receptor); Wilkins #975XL2 2" and smaller; #375XL 2-1/2" and larger, Watts, Apollo, or equal.
- E. Compressed Air:
1. NibcoT-585-70-SV (Ball) rating 300 PSI at 70° F or NibcoT-235, Hammond 1B413T, Milwaukee 590T (Globe) rating 150 psi at 200° F.
- F. Thermometers, gauges, temperature sensing devices and aquastat shall be equal to Honeywell, Weiss, Trerice, or equal.
- 2.05 GAS VENTING:
- A. The gas vent system shall be so engineered and constructed as to develop a positive flow adequate to exhaust all flue gases to outside atmosphere, without condensation with the vent or spillage at any appliance draft hood.
- B. All parts of vent system shall be of Underwriters' Laboratories, Inc., listed Metalbestos type B double wall gas vent piping, and such piping shall be continuous from the appliance outlets into Metalbestos vent top.

- C. The Metalbestos, Dura Vent, or equal gas vent piping shall be installed in full compliance with the terms of its listing, with the manufacturer's installation instructions, and with building codes representing good practice for such installations.

2.06 YARD BOXES:

- A. "Brooks Products" 3TL concrete, Jensen Precast, Oldcastle, or equal, with hinged cast-iron locking traffic cover in walks and traffic areas, No. 3MA with reinforce concrete cover in planter areas. Cover to be marked with name of service.

2.07 CLEANOUTS:

- A. Cleanouts shall be manufactured by Zurn, J.R. Smith, Josam, or equal.
- B. Floor Cleanouts: Zurn ZN 1400-K-HD, J.R. Smith Fig. 4104-F-NB, Josam, or equal, with satin nickel bronze non-skid adjustable round top, flashing device. For carpeted areas install carpet markers-C.
- C. Wall Cleanouts: Zurn Z-1446, J.R. Smith Fig. 4532, Josam, or equal, with stainless steel or chrome plated cover and screws.
- D. Outside Cleanouts: Josam 58850 series, J.R. Smith Fig. 4253-U, Zurn Z1474-IN-VP, or equal low type anchoring flange in finished grade areas. Vandal proof covers to be marked "Cleanout." Encase anchoring flange in 20" square x 6" concrete pad, top of cleanout flush with finished surface. Option: J.R. Smith Fig. 4280, Josam 58480, Zurn Z1449, or equal cleanout in yard box specified above with 6" thick concrete, 8" all around box.

2.08 FLASHINGS:

- A. "Stoneman" No. 1100-4, GAF, Menards, or equal, four pound, seamless lead flashing assembly. Flashing shall have reinforced boot complete with cast-iron counterflashing sleeve and Permaseal waterproofing compound. All vent pipes shall be terminated 12" above the roof. (Roof penetrations per roofing inspector standards.)

2.09 HANGERS, SUPPORTS AND ACCESS PANELS:

- A. Hangers and supports shall comply with the currently adopted edition of the California Plumbing Code and the IAPMO installation standards. Provide seismic support per the California Building Code.
- B. Hangers and Supports:
 - 1. Split Ring or Loop Hangers with Swivel Adjuster, Solid Rods and Rod Sockets: B-line, Unistrut, Tolco, or equal.
 - 2. Concrete Inserts: B-line, Unistrut, Tolco, or equal. Power driven anchors are not acceptable.
 - 3. Trapeze Hangers: B-line, Unistrut, Tolco, or equal channel with pipe clamps and guides as required (include type to be used in submittal).
 - 4. Riser Clamps: B-line, Unistrut, Tolco, or equal.
 - 5. Offset Pipe Clamps: B-line, Unistrut, Tolco, or equal.

6. Hot and Cold Water Pipe Isolation: 1-inch hair felt, Stoneman Trisolators, B-Line Isolators, HoldRite, or equal.
 7. Provide and install galvanized pipe saddle at hangers under pipe inserts for insulated piping.
 8. Floor or Roof Supports: Erico, Dura-Blok, Mifab, or equal.
- C. Access Panel for Valves and Water Hammer Arresters: Milcor, Elmdor, Karp, or equal painted steel, size as required for easy access, fire rated as required to match fire rating of wall assembly. Minimum size shall be 12" x 12".
 - D. Fixture Supports: Furnish wall hung fixtures with supports by Zurn, J.R. Smith, Josam, or equal.
 1. Lavatories: Zurn, Z-1231-SL, J.R. Smith 700, Josam, or equal.
 - E. Secondary Pipe Positioning & Supports: Makeshift, field devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. These shall be Hubbard Enterprises/HOLDRITE support systems or Owner-approved equivalent.
 - F. Plenum Installations: Use pipe supports and hangers that meet ASTM E-84 25/50 standards, such as the Hubbard Enterprises/HOLDRITE Flame Fighter™ or Owner-approved equivalent.
 - G. For vertical mid-span supports of piping 4" and under, use Hubbard Enterprises/HOLDRITE Stout Brackets™ with Hubbard Enterprises/HOLDRITE Stout Clamps or two-hole pipe clamps (MSS Type 26), by B-Line, Tolco, or equal.
 - H. Support of piping, tubing, and equipment shall be accomplished by means of engineered products, specific to each application. Makeshift, field devised methods shall not be allowed.
- 2.10 PLUMBING EQUIPMENT:
- A. The equipment described in Part 2 of this Section shall be furnished and installed complete under this section of the specifications. See "Equipment Schedule" on drawings for size, capacity, and electrical characteristics.
 - B. Water heaters shall be listed in the State of California Energy Commission Directory of Certified Water Heaters.
 - C. Thermal Expansion Absorber: Provide at water heaters and boilers where there is a reduced pressure backflow preventer in the system, equal to Flexcon WH series, Amtrol ST series, Wilkins HXT series, or equal.
 - D. Water heaters, storage tanks, and expansion tanks installed in seismic zones shall be supported from the adjoining structure by the use of DSA approved safety restrain devices. Use QuickStrap from Hubbard Enterprises/HOLDRITE or Owner-approved equivalent.
 - E. Water heaters shall be constructed in accordance with the *ASME Boiler and Pressure Vessel Code* when the input is greater than or equal to 200,000 BTU per hour or when the storage capacity is greater than 120 gallons.

- F. Water heaters shall be installed on a galvanized steel metal stand, 16 gauge, cold rolled, having a minimum height of 16" above the floor. Wall-hung water heaters shall be installed on a wall-mounted, galvanized steel platform, 18 gauge, cold rolled, complete with drain outlet, 45° brackets and threaded rods, Hubbard Enterprises/HOLDRITE or equal.

2.11 PLUMBING FIXTURES:

A. General Requirements:

1. All fixtures shall comply with State of California Energy Commission requirement for maximum flow. Submit manufacturer's certification of compliance.
2. Unless otherwise noted, all vitreous china or enameled cast-iron fixtures shall be white. Unless noted otherwise, all toilet seats shall be open front, white and less cover.
3. Furnish and install fixtures as specified on the plumbing fixture connection schedule.

- B. P-Traps: BrassCraft, Zurn, Oatey, or equal, chrome plated drawn brass with 17 gauge tubing drain to wall. Trap arms under lavatories and escutcheon at wall shall also be chrome plated.

C. Job Conditions:

1. Check millworks shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
2. Supplies shall be with stops and flexible riser.
3. Traps above floor shall be tubular brass "P" traps with bronze nuts unless otherwise indicated.

2.12 PLUMBING EQUIPMENT SPECIFICATION SCHEDULE:

- A. See Water Heater Schedule on plumbing schedule sheets.

2.13 PLUMBING FIXTURE SPECIFICATION SCHEDULE:

- A. See Fixture Connection Schedule on plumbing schedule sheets.

2.14 PIPE WRAPPING:

A. Steel Piping in Concrete or Underground:

1. Wrap with approved tape products.
2. Wrap joints and fittings in the field with "Polyken" tape and primer.

2.15 SLEEVES:

A. General:

1. Where pipes pass through concrete, masonry, or stud walls, or pass through ceilings, provide rust-proof sleeves of the size required.
2. Provide UL-listed fire rated sealant (specialty products, or equal) at all penetrations of fire-rated assemblies and between buildings along property line.

2.16 PIPE PENETRATION CURB:

- A. Provide pipe penetration curbs for all piping extending through roofing/weather proofing membranes.

2.17 OTHER PRODUCTS:

- A. Provide all other products necessary for complete installation and operation including rough-ins as required for washers and dryers. Such products shall be subject to the review of the Architect.

2.18 FIRE STOP PROTECTION:

- A. Provide slab, wall and roof penetrations with fire stop in accordance with chapter 14 of the latest CPC.
- B. System shall be installed as tested in accordance with ASTM E119, ASTM E 814, UL 263 or UL 1479.
- C. Fire stop shall have a fire-resistance rating of not less than one (1) hour and shall match the rating of the slab, wall or roof assembly.
- D. System shall be equal to HoldRite Hybrid Flame Sleeving System, Pro-Set Pipe/Sleeve system, Hilti, or equal.

PART 3 – EXECUTION

3.01 INSULATION INSTALLATION:

- A. Install insulation after piping has been installed, tested, and accepted and after pipes are in a clean, dry condition. All joints in insulation shall be butted firmly together and sealed with jacket lap strip.
- B. Apply insulation to all fittings and valve bodies. Flanges and unions shall not be covered.
- C. Where the insulation supports the weight of the pipe, install a 12" insert of rigid galvanized steel, at each pipe clamp or hanger, an insert of rigid "Kaylo" 12" long, shall be installed between pipe and hanger. High density fiberglass inserts shall be installed with galvanized saddles.
- D. Condensate drain pipe shall be completely insulated throughout the entire system.

3.02 PIPE INSTALLATION:

- A. Cast iron piping shall be installed in accordance with Chapter 4 of the CISPI "Cast Iron Soil Pipe and Fittings Handbook," latest edition, and the current edition of IAPMO Installation Standard IS-6.
- B. Copper tubing shall be installed in accordance with the latest edition of the Copper Development Association "Copper Tube Handbook." Joints in copper tubing shall be made by first thoroughly cleaning the surface of the pipe and fittings, applying a copperized flux and sweating with lead free solder for all water piping and condensate piping above grade and below grade.
- C. Fluxes shall comply with ASTM B813 and shall be compatible with the lead-free solder used. Fluxes labeled as "self-cleaning" shall not be used.
- D. All pipe shall be carefully cleaned before installation. The ends of threaded steel pipe shall be reamed out full size with a long tapered reamer so as to be partially bell-mouthed and perfectly smooth. Openings in pipes, drains, fitting apparatus and equipment shall be kept covered or plugged to prevent foreign substance from entering.
- E. The grade of all sanitary sewers, storm drains and waste lines shall be as indicated on drawings, but not less than 1% slope. Sections of pipe shall be installed so as to provide smooth and uniform invert. Water shall not be allowed in the trenches while the sewer lines are being laid. Dirt, cement, or any other superfluous material shall be carefully removed from piping as the work progresses. Constant inspection shall be made of pipe and fittings during and after all installation for possible fractures and failures caused by installation. Backfill so as not to disturb pipe or jointing.
- F. Flush out all water mains, sanitary and condensate drains with water so as to obtain free flow. Remove all obstructions and defects discovered. Remove and replace items already installed and found to be defective or which has had grade or joints disturbed at no additional cost.
- G. Run piping free of traps, sags, or bends. Grade and valve for complete drainage and control of the system.
- H. All piping shall be installed to maintain headroom and keep passageways and openings clear. Install piping parallel and straight with adjacent walls or ceilings to present a uniform appearance. All piping, except where noted otherwise on plans, shall be concealed in walls or above ceilings. Route piping to avoid electrical rooms. Do not route waste piping above kitchen areas. Do not route plastic pipe in return air plenums unless the pipe is plenum-rated with a flame spread index of 25 or less and a smoke developed index of 50 or less.
- I. PVC DWV piping shall be installed in accordance with the current editions of IAPMO Installation Standards 5 and 9 and chapter 14 of the California Plumbing Code, "Firestop Protection."
- J. Bending or forcing of pipe will not be allowed. Use fittings for all offsets or changes in alignment of piping.
- K. Proper provision shall be made for expansion and contraction by means of fittings and anchors and supports of all piping as described in the current editions of IAPMO Installation Standards 5 and 9.
- L. Proper provisions shall be made for seismic joints by means of seismic expansion joint fittings capable of movement in all directions in accordance with Structural seismic movement requirements.

- M. Bushings and long screw fittings will not be allowed.
- N. Install water hammer arresters on water piping to all flush valves, foot pedal valves, dish and clothes washers and quick closing valves per PDI-WH 201 standards. The completed system shall be free of water hammer noise.
- O. Unions shall be installed after each screw-type valve, connections for all equipment, appliances, and as required for erection and maintenance. No unions shall be installed in concealed locations. Unions are not required on installations using grooved joint couplings. Install isolation unions or waterway fittings on all connections between dissimilar metals and at connections to all water heating equipment and storage tanks.
- P. Provide grounding and bonding of metallic gas piping per the National Gas Code and the National Electric Code. Use mechanical or welded clamps and copper wire. Coordinate grounding with other grounding elements provided by the electrical contractor.
- Q. No holes for pipe or equipment will be allowed in any structural members without written consent of the Architect. Where pipes are to pass through or interfere with any member, or where notching, boring or cutting of the structure is necessary, the work shall be done by the General Contractor as directed. Isolate pipe from coming in direct contact with the structure.
- R. Unless otherwise specified herein, all equipment and fixtures shall be installed in accordance with the manufacturer's printed instructions and recommendations.
- S. Any minor changes in work, which have not been installed, shall be made by the Contractor without additional compensation, except changes which are caused by architectural revisions resulting in an increase or decrease of the size or quantity of the materials specified or indicated on the drawings. The Contractor shall submit an estimate of the cost of or credit for such changes which are not judged to be of a minor nature and shall proceed only upon the written authorization of the Architect.
- T. All piping shall be isolated from other piping, studs, ducts, any part of the building, framing, hangers, conduit, etc., with 1" strips of hair felt or pipe isolators.
- U. For condensate piping, provide minimum 3" deep seal trap and plugged cleanout tee at the equipment connection. Slope piping at $\frac{1}{8}$ " per foot minimum.
- V. PE Piping: Installation practices shall be in accordance with manufacturer's printed recommendations and current edition of IAPMO Installation Standard 12. Underground gas piping shall have a minimum coverage of 36". Where pipes cross another service, separation shall be not less than 12". Pipes run in the same trench shall be separated by not less than 12". Riser to gas meter, pressure regulators and building risers shall be plastic covered steel with approved corrosion-resisting wrapping. Plastic pipe shall not be installed within or under a building or structure. Plastic pipe shall not be left exposed to sunlight. Plastic pipe shall be "snaked" from side to side of trench bottom to allow for expansion and contraction of pipe. Backfill trenches when ambient temperature has stabilized at 80° F or less. Tracer wire not less than AWG 14 shall be spirally wrap wound and taped to pipe at distances of approximately 2-feet. Terminate wires at terminals by taping wire to riser 12" above grade. Where wire is spliced, mechanically bond bare wire ends together and wrap bare wire with plastic tape. Piping shall not be joined by threaded joints. Joints made with adhesives or solvent cement shall be prohibited.
- W. For buried piping, backfill with sand 6" all around, tamp and backfill to grade as specified in relevant "Excavation and Backfill" Specification Section.

- X. Compressed air piping shall be installed so that main piping will slope back to compressor, or to a drain point(s) identified on the drawings. All take-offs from main lines shall be off the top with not less than a 6" vertical leg.
 - Y. Provide and install polished chromium plate split ring escutcheons for pipes exposed in the building.
 - Z. On-site underground gas piping trench shall comply with the trenching requirements of the gas utility provider, including depth of coverage. Distance from wet utilities shall be 60 inches minimum.
- 3.03 CLEANOUTS:
- A. Cleanouts shall be caulked into or clamped to pipe where shown on plans. Install under counter tops where they occur or in walls to avoid exposed condition. Cleanouts shall be accessible in all cases and shall be brought to surface on "Y" branches. All cleanouts shall be provided with removable floor or wall plate as specified in Part 2.
 - B. Wall cleanouts shall be provided for all sinks and kitchen sinks per the California Plumbing Code.
- 3.04 PIPE HANGER AND SUPPORTS:
- A. Installation shall comply with the currently accepted edition of the California Plumbing Code.
 - B. Piping shall be firmly held in place by adjustable split ring malleable iron hangers, supports and pipe rests, located adjacent to fitting at each offset or change of direction, at the ends of branches over 5' long, at base of riser pipes and along piping where necessary to prevent sags, bends, or vibration. All hangers and supports shall be of design which will support weight of pipe, fluid and insulation and prevent sagging.
 - C. Pipe clamps shall be heavy gauge iron, factory fabricated to fit against supporting surface when installed. Makeshift devices will not be acceptable. Plumbing tape is not allowed.
 - D. Seismically brace all piping and equipment as specified in Section 230000 and per California Building Code.
 - E. Hangers supported by concrete structure shall be attached by cast-iron manufactured concrete inserts installed at the time concrete is poured and each insert shall be provided with through rods lapped over structural reinforcing. Power driven fasteners are not acceptable.
 - F. Hangers supported by structural steel shapes shall be attached by cast-iron clamps designed for use on the specific steel shape and equipped with retainers.
 - G. All hangers shall be attached to halter rods by means of adjustable swivel, turnbuckle or double nut arrangement to allow height adjustment.
 - H. Vertical piping shall be suitably supported from the building structure where required by means of malleable iron or steel pipe clamps of ample size, either bolted or welded to the pipe and supported at the floor slab. Supports shall also act as anchors to allow for expansion and contraction of the piping. Provide rubber isolators for clamps where required for elimination of vibration and sound transmission to the structure. Vertical "no-hub" components shall be secured at each joint and at each floor.

- I. Miscellaneous Supports: Floor and wall brackets, etc., shall be provided where required in accordance with the best standard practice of the trade. In the event additional structural steel is required to transmit loads to maintain structure, same shall be provided at no additional cost to the Owner.
 - J. Support of piping, tubing, and equipment shall be accomplished by means of engineered products, specific to each application. Makeshift, field-devised methods shall not be allowed.
 - K. Horizontal Cast-Iron Piping:
 - 1. Supports shall maintain alignment and prevent sagging and shall be placed within 18" of the hub or joint. When the developed length between supports exceeds 4 feet, they shall be provided at each side of every joint. Supports shall also be provided at each horizontal branch connection. Suspended lines shall be braced to prevent horizontal movement as specified in Section 230000.
 - 2. Hanger rod sizes shall be in accordance with Table 313.6 of the California Plumbing Code.
 - 3. Trap arms and similar branches shall be firmly secured against movement in any direction. Closet bends shall be stabilized by firmly clamping and blocking. Where vertical closet stubs are used they shall be completely stabilized against all movement.
 - L. Hangers for horizontal copper tubing and steel pipe shall be spaced in accordance with Table 313.3 of the California Plumbing Code.
 - M. PVC DWV hangers at 4' on center at the end of the branch changes in direction and per the current editions of the IAPMO Installation Standard 5 and 9.
 - N. All hangers for water piping shall be sized for use over trisolator or 1-inch hair felt.
- 3.05 SLEEVES AND OPENINGS:
- A. Provide standard weight black steel pipe sleeves for each pipe passing through foundation, walls, partitions, roofs, and ceiling. Pipe sleeves shall be installed flush with wall or floor.
 - 1. Set pipe sleeves in place before concrete is poured.
 - 2. For uninsulated pipe, provide sleeves that are two pipe sizes larger than the pipe passing through the opening, or provide a minimum of 1/2" clearance between inside of the opening and outside of the pipe.
 - 3. For insulated pipe, provide sleeves of adequate size to accommodate the full thickness of pipe covering with clearance for packing and caulking.
 - B. Caulk the space between sleeve and pipe or pipe covering.
 - C. Finish and Escutcheons:
 - 1. Smooth up rough edges around sleeves with plaster or spackling compound.
 - 2. Provide escutcheons on all pipes exposed to view where passing through walls, partitions, ceilings, and similar locations.
 - a. Size the escutcheons to fit pipe and covering.

- b. Hold escutcheons in place with set screw, or set in full bed of sealant.
 - c. Where directed by Architect, paint escutcheon to match adjacent finish color.
 - D. Sleeve diameter for piping through a masonry wall above grade or through floors shall be #10 gauge galvanized sheet steel and shall extend completely through the walls or floor finishing flush on both sides. The sleeve shall be 1" larger than the pipe with caulking to make the opening airtight.
 - E. Sleeves through the fire walls or floors shall be packed with UL Listed fireproof wicking or other suitable noncombustible material to maintain the fire rating of the wall or floor assembly.
- 3.06 VALVES:
- A. Provide valves in water and gas systems. Locate and arrange so as to give complete regulation of apparatus and fixtures.
 - B. Provide valves in at least the following locations:
 - 1. In branches and/or headers of water piping serving a group of fixtures.
 - 2. Shut-off valves at piping supply to the facility.
 - 3. For shutoff of branch mains.
 - 4. For flushing and sterilizing the system.
 - 5. WYE Strainer at main supply.
 - C. Locate valves for easy accessibility and maintenance.
 - D. Install Y-pattern strainers for water on supply side of each balancing valve, control valve, water pressure-reducing valve, solenoid valve and pump.
- 3.07 WATER HAMMER ARRESTORS:
- A. Provide water hammer arrestors on hot water lines and cold water lines.
 - 1. Install in upright position at all quick closing valves, solenoids, isolated plumbing fixtures, and supply headers at plumbing fixture group.
 - 2. Locate and size in accordance with Plumbing and Drainage Institute Standard PDI-WH 201.
 - 3. Install water hammer arrestors behind access panels or ceiling panels.
- 3.08 BACKFLOW PREVENTION:
- A. Protect plumbing fixtures, faucets with hose connections, and other equipment having plumbing connections against possible back-siphonage.
 - B. Arrange for testing of backflow devices as required by the governmental agencies having jurisdiction.

3.09 CONCRETE:

- A. Provide concrete required for the work of this Section in strict accordance with pertinent provisions of Division 3.

3.10 FIXTURE INSTALLATION:

- A. All plumbing fixtures shall be bedded and caulked along joint at walls, counter tops, and other intersecting surfaces with white adhesive caulking.
- B. Plumbing fixture trim and exposed supplies and "P" trap and arm shall be brass with polished chrome plated finish. Individual wheel handle, loose key stops, or, when so specified, screwdriver stops, shall be provided for all supplies, and unless integral with valves or faucets, or unless otherwise permitted, shall be mounted under the fixture. Exposed water supply and waste piping to wall shall be provided with polished chrome plated brass wall escutcheons.
- C. Fixtures with hangers or supporting arms shall have hangers or arms securely mounted on a ¼" thick x 6" wide steel wall plate which shall extend at least one stud beyond the first and last fixture mounting points. Concealed arm assemblies shall be attached to plates by four ⅜" x 1-¼" steel bolts and nuts, and hangers and exposed arms by 5/16" minimum full thread steel studs and jamb nuts. Plates shall be drilled and tapped at the time of fixture installation.
- D. Wall plates shall be recessed flush with studs and shall be securely attached to each stud crossed. In steel stud construction, a 1-½" x 18" long furring channel shall be attached to each notched stud with fillet welds 1" long on 6" centers front and back. Plates shall be continuous fillet welded at both top and bottom to each furring channel. Provide backing for each plumbing fixture requiring same, at the time roughing-in is done.
- E. Where drains are specified with clamping collars, the water proofing membrane and flashing shall be carefully cut to fit the drain, then anchored between drain and collar with rustproof bolts. See Part 2 for flashings.
- F. Traps above floor shall be cast brass "P" traps with bronze nuts unless otherwise indicated.
- G. Provide branch tailpieces off air vent lines where required.
- H. All fixtures designated for use by the disabled shall be in compliance with current applicable codes, Title 24, and *California Disabled Accessibility* guide book.
 - 1. Water Closets: Installed height shall be a minimum of 17" and a maximum of 19" measured to the top of the toilet seat. Flush controls shall be hand operated or automatic. Hand operated controls shall be operable with one hand and shall not require tight grasping, pinching or twisting. Controls for the flush valves shall be mounted on the open side of the water closet no more than 44 inches above the floor. Flush controls shall be operable by an oscillating handle with a maximum operating force of 5 lbf.
 - 2. Lavatories: The top of the lavatory fixture rim shall be a maximum of 34 inches above the finished floor. Water supply and drain pipes under lavatories shall be insulated or otherwise covered to protect against contact. There shall be no sharp or abrasive surfaces under lavatories. Faucet controls and operation mechanisms shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist. The force required to activate controls shall be no greater than 5 lbf. Hand operated metering faucets are allowed if the faucet remains open for at least 10 seconds.

3. Drinking Fountains: The drinking fountain shall be 18" to 19" in depth. Provide clear and unobstructed space not less than 27" in height and 18" in depth, the depth measurements being taken from the front edge of the fountain. The bubbler shall be activated by a hand-operated lever type control located within 6" of the front of the fountain. The bubbler outlet orifice shall be located within 5" of the front of the drinking fountain and shall be within 36" of the floor. The water stream from the bubbler shall be substantially parallel to the front edge of the drinking fountain and shall provide a flow of water at least 4 inches high to allow the insertion of a cup or glass under the flow of water.
 - I. Fit-up connections to equipment (furnished by others) shall be provided with valves, unions, flexible connectors, and adapters to make a final connection. Piping stubouts for equipment will be extended to make the final connection. The connection shall be made with devices recommended by the equipment manufacturer. Field verify exact point of connection prior to start of work.
- 3.11 SEISMIC RESTRAINT:
- A. General:
 1. Furnish and install seismic restraint for all piping, equipment, etc., installed under the contract. All restraints shall meet the requirements of the current California Building Code.
 2. Seismic restraints shall be designed and installed in accordance with good engineering practice to the approval of a Professional Engineer. The design and installation of restraints shall be generally in accordance with the current editions of the California Building Code all of which shall form and become a part of this installation.
 - B. Seismic Equipment:
 1. All manufactured equipment, pumps, tanks, water heaters, unit heaters, compressors, etc., shall be complete with manufacturers' designed and rated seismic restraint anchor points and attachments so that they may be easily bolted down or restrained in the field. Equipment attachment anchor points shall be certified by the manufacturer. The equipment manufacturers of any mechanical equipment used on this project must design their equipment so that the strength and anchorage of the internal components of the equipment exceeds the force level used to restrain and anchor the equipment itself to the supporting structure.
- 3.12 PROTECTION OF PIPING SYSTEMS:
- A. It shall be the responsibility of the Contractor to install and maintain pipe and equipment which is reasonably clean and free from rust, dirt, scale, etc. Where necessary, the Contractor shall provide temporary airtight covers at all pipe and equipment openings.
 - B. Before turning the systems over to the Owner, all piping systems shall be thoroughly flushed of all scale and dirt. Drains shall be installed at the low points to facilitate flushing of the piping systems.

3.13 PAINTING:

A. General:

1. Prime paint all ferrous metal items, except items to be encased in concrete, areas adjacent to field welds, and roof drains.
2. Clean all items free of loose mill scale, rust, and other contaminants.
3. For roof-mounted equipment, provide factory prefinish on all exposed surfaces.
4. Touch-up scratches and abrasions to be invisible to the unaided eye from a distance of 5'0".

3.14 REQUIREMENTS FOR FINAL INSPECTION:

- A. All requirements shall be completed prior to final inspections.
- B. Thoroughly clean all parts of the piping, valves, and equipment. Exposed parts which are to be painted shall be thoroughly cleaned of cement, plaster, oil and grease spots. Such surfaces shall be carefully wiped and all cracks and corners scraped out.
- C. Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots, leaving a smooth and clean surface. Trap elements shall be removed during the cleaning and flushing period, after which they shall be replaced and adjusted.
- D. Electrical device covers shall not be installed until the finished coating of paint is completed. Device handles and receptacles shall be covered and/or protected during the painting operation to preserve the original factory bright new finish.
- E. All potable water lines shall be sterilized with chlorine. The chlorine residual concentration shall indicate not less than 50 parts per million (ppm) and shall be retained for a period of not less than 24 hours or per CPC 609.10 - (2). Repeat procedure if the residual concentration has decreased below 25 ppm. After test is in compliance with this specification, flush the system until the residual is not more than 0.5 ppm. All work and certification of performance must be done by qualified personnel. Submit certification to Architect.

NOTE: During construction phase, install Tee's and ball valves at locations directed and as required to facilitate sterilization and testing. Identify and indicate on the as-built plans the location of valves and ensure that they are accessible and are in a position not to cause cross-connections or artificial pressure loss in the system.

3.15 TESTS AND ADJUSTMENTS:

- A. No piping work, fixtures, or equipment shall be concealed or covered until inspected by the Architect/Owner's Representative, who shall be notified when the work is ready for inspection. All work shall be completely installed, tested as required by local code, this section and the State Ordinances and State Safety Orders, and shall be leak-tight before inspection is requested. All tests shall be repeated as required by those making the inspection.
- B. All domestic water piping shall be flushed out, tested at 150 psig and shall be left under pressure of supply main or a minimum of 50 psi, whichever is greater, for the balance of the construction period. No air testing is allowed. Tests are to be applied for a minimum period of one hour.

- C. Soil, waste, vent, condensate and storm drain piping within the building shall be tested with a minimum of 10-foot head at each joint for a minimum of 3 hours with no loss in head.
- D. Fuel Gas Piping Tests: For steel piping above grade, blow all piping with compressed air and test at 10 psig for one hour. For welded piping and for piping carrying gas at pressures in excess of 14" water column pressure, the test pressure shall be 60 psig and held for one hour. Soap test all joints in addition to the gauge test.
- E. Plumbing fixtures shall be filled with water and checked for leaks and retarded drainage flow. Faucet aerators and shower heads shall be removed and cleaned thoroughly and flow shall be adjusted to eliminate dripping or splashing.
- F. Final pressures at the end of the test period for all piping systems shall be no more nor less than that caused by expansion or contraction of the test medium due to temperature changes.
- G. All protective coating systems shall be visually inspected for breaks in the coating system. Any holidays revealed shall be promptly repaired per manufacturer's instructions for repair of damaged pipe coatings.
- H. Cross-Connection Tests By Testing Agency: Comply with NFPA 99. Pressurize each system with nitrogen in accordance with Table 3. Check 100 percent of the outlets in each system. Include anesthesia gas evacuation in vacuum systems.

3.16 DRAWINGS OF RECORD:

- A. In addition to the "As-Built" drawings required, two complete sets of printed mechanical drawings shall be provided by the Architect for the purpose of showing a complete picture of the work as actually installed.
- B. These drawings shall serve as work progress report sheets and the Contractor shall make all notations, neat and legible, thereon daily as the work proceeds. The drawings shall be available for inspection at all times and shall be kept at the job at a location designated.
- C. At the completion of the work, these as-built drawings shall be signed by the Contractor indicating approval thereof, dated and returned to the Architect.
- D. The dimensions, locations and invert elevations of buried piping shall be accurately recorded on the as-built drawings. Dimensions shall be from permanent building walls (not from column lines).

3.17 GUARANTEE:

- A. All work under this section shall be guaranteed in writing in accordance with the "Mechanical General Provisions," Section 230000.
- B. All material except as otherwise noted shall be new, free from defect and of the quality and rating shown or specified.
- C. Any defect due to missing or improper material or faulty workmanship existing or developing during the warranty period shall be corrected and the resulting damage repaired.
- D. The warranty period shall be one year from date of acceptance of the project, except for items guaranteed by the manufacturer for a longer period.

3.18 OPERATING INSTRUCTION AND SERVICE MANUAL:

- A. The Contractor shall carefully prepare an operating instruction and service manual for the entire system including all equipment, excepting Owner-furnished equipment. The manual shall be submitted for review to the Architect at least 30 days prior to completion of the work. Failure to submit manual will delay final inspection and acceptance of the work. Contents shall be bound in a durable loose-leaf binder, complete with index.
- B. The following items shall be included in the manual. This list may not be complete and is to be used as a guide:
 - 1. Part numbers of all replaceable items.
 - 2. Manufacturer's cut sheets and rating tables, including brochures on all fixtures, equipment and materials installed.
 - 3. Oiling, lubrication and greasing instructions, including maintenance time schedule.
 - 4. Test data on all equipment.
 - 5. Serial numbers of all principal pieces of equipment.
 - 6. The names, addresses, phone and emergency phone numbers of the manufacturers' and subcontractors' suppliers.
 - 7. Valve chart indicating location of valves for the project.
 - 8. Written guarantee.
 - 9. Prints of complete as-built drawings, signed by the Contractor.
 - 10. Reviewed submittal data and shop drawings in binder.
 - 11. Test and balance data and copies of building inspections check lists signed off by the Inspector.
 - 12. Potable water piping sterilization certificate.
 - 13. Pipe and equipment identification schedule.
- C. After review of the manual by the Engineer, two copies of each manual shall be furnished for distribution.

3.19 IDENTIFICATION OF PIPING AND EQUIPMENT:

- A. Identify all equipment with nameplates bearing equipment name and number using 1-½" wide, white Bakelite with ½" black letters permanently mounted in a conspicuous place.
- B. Markings: Each piping system shall be identified and the direction of flow indicated by means of legends, color bands and flow arrows. The markings shall be applied after all painting and cleaning of the piping and insulation is completed. The stick-ons shall be taped all around the pipe in addition to being cemented on.

C. Location:

1. The identification shall be applied to all piping except those located in furred spaces without access to permit entrance of personnel and piping buried in the ground or concrete.
2. The symbol and flow arrow shall be applied at all valve locations, at all points where piping enters or leaves a wall, partition, cluster of piping or similar obstruction and at approximately 30-foot intervals on runs with at least one symbol or flow arrow in each space or room.
3. Variation or changes in locations and spacing may be made only with the direction of the Architect to meet conditions.
4. Wherever two or more pipes run parallel, the printed symbol and other markings shall be applied in the same relative locations so as to be in either vertical or horizontal linearity, whichever the case may be.
5. The markings shall be located so as to be conspicuous and legible at all times from any reasonable point.

D. Sizes shall be as recommended in ANSI A13.1.

E. As an alternate to the above, the Contractor may submit a system of painted stenciled letters on a color coded background per ANSI A13.1. Complete data, color chart and sizes shall be submitted for review.

F. Valve charts shall be provided for each piping system and shall consist of schematic drawings of piping layouts showing and identifying each valve and describing its function. Upon completion of the work and after approval by the Architect, one copy of each chart, sealed to rigid backboard with clear lacquer placed under glass and framed, shall be mounted in the mechanical room where directed by the Owner. Two additional unmounted copies shall be delivered to the Owner. Valve lists shall be furnished as required.

G. Name Tags: Provide 1 $\frac{1}{4}$ " plastic square of 1 $\frac{1}{4}$ " round with $\frac{1}{4}$ " letters for all valves. Black letters on white tags and marked for type of service intended. Attach tags to valve handles by "S" hooks. Furnish four printed lists showing valve number, service and location. One of these lists shall be individually framed with metal frames and glass fronts and mounted where directed by the Owner after approval. One additional copy shall be furnished as required.

3.20 BALANCING WATER SYSTEMS:

A. The systems shall be balanced using the cocks and balance valves specified to obtain desired flow quantities through all heating elements, coils, etc. A full typed report of the balancing shall be provided to the Consultant for approval and, following acceptance of the report, a copy shall be incorporated within each maintenance manual specified. The Contractor shall include separately for his own work as required to coordinate with the testing agency and balancing water systems.

B. Testing forms shall be equivalent to those available from A.A.B.C. and data shall consist of at least the following:

1. Differential head and shut-off head across circulating pumps.

2. Temperature drop across heating elements, cooling coils, heating coils, etc. Radiant ceiling systems to be balanced to give equal temperature drop.
3. Flow quantities in gpm for all systems equipped with flow meters.

3.21 DOMESTIC HOT WATER COMMISSIONING

A. Functional Performance Tests:

1. Time required to reach set point at fixtures: 30-45 seconds
2. Temperature required at fixtures: 105-110 degrees F
3. Temperature set point at primary mixing valve: 120 degrees F
4. Quantity of fixtures to be tested: 10%
5. Capacity testing for temperature at peak flow: 30-45 minutes
(typically tested at mop sink)

END OF SECTION

SECTION 23 00 00

MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL REQUIREMENTS

1.01 GENERAL CONDITIONS:

The general conditions and Division 1 are a part of this section and the contract for this work and apply to this section as fully as if repeated herein. This section, 230000, applies to all Division 23 categories, including but not limited to:

Section	22 04 00	Plumbing
	23 30 00	Heating, Ventilating and Air Conditioning
	23 34 43	Vehicle Exhaust Removal

- A. Reference to Other Sections: The applicable requirements from the above sections shall form a part of the mechanical work and each section shall consult the other sections in detail for general and specific requirements.

1.02 SCOPE:

These Division 23 specifications and the accompanying drawings are intended to comprise the furnishing of all labor, and the furnishing and installing of all materials, equipment and supplies as specified herein and required for the satisfactory completion by the Contractor of all work pertaining to mechanical trades.

1.03 EXPLANATION OF DRAWINGS AND REFERENCE TO SCHEDULES:

- A. The drawings and these specifications are complementary to each other in that all apparatus, materials and equipment outlined in the drawings and/or specified herein shall be considered essential to the contract.
- B. The specifications are intended to describe the quality and character of the materials and equipment and methods of installation. All miscellaneous items of work and materials necessary for the completion of the installation shall be provided, whether or not mentioned in the specifications or shown on the drawings.
- C. Space allotted, clearances, access, electrical data, structural supports, etc., on drawings, is for equipment models and sizes as listed in schedules on plans. The Contractor shall assume the responsibility for the coordination with other trades required in the use of equal or substitute equipment or materials and pay all difference in cost arising from such substitutions, regardless of approval.
- D. Separate Sections cover the Site Work, Architectural Work and the Electrical Work. The Contractor shall familiarize themselves with the entire specification.
- E. Should there be any question as to the scope of the work for which the Contractor is responsible, they shall ask the Architect for an interpretation before submitting their bid. In the event that the Contractor finds discrepancies or omissions or is in doubt as to the exact meaning of the plans and/or specifications, they shall, before submitting bid, contact the Mechanical Engineer for clarification.
- F. For purposes of clearness and legibility, drawings are diagrammatic and, although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data in all the contract documents and shall verify this information at building site.

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- G. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets and beam cans, and it shall be the work of the Contractor to make the installation in such a manner as to conform to structure, avoid obstruction, preserve headroom and keep openings and passageways clear.
- H. It is intended that all apparatus be located symmetrical with architectural elements. Refer to architectural details in completing the correlating work.
- I. The Contractor shall fully inform themselves regarding any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the contract. They shall exercise due and particular caution to determine that all parts of their work are made quickly and easily accessible.
- J. The Contractor shall study all drawings and specifications to determine any conflict with ordinances and statutes. Any errors or omissions shall be reported, and any changes shall be shown in the as-built drawings and the additional work performed at no cost to the Owner.
- K. The submittal of bid shall indicate that the Contractor has examined the site and the drawings and has included all required allowances in their bid. They shall also determine in advance and make allowances for the methods of installing and connecting the equipment, the means of getting equipment in to place and they shall make themselves familiar with all the requirements of the contract. No allowance will be made for any error resulting from the Contractor's failure to visit job site and to review drawings, and bid shall include costs for all required drawings and changes as outlined above.
- L. The Contract Drawings indicate the extent, the general location and arrangement of equipment, piping, ductwork, etc. Equipment, piping and ductwork shall be located to avoid interference with electrical, plumbing and structural features. All locations for mechanical work shall be checked and coordinated with the building, structural, electrical work.
- M. If any conflicts occur necessitating departures from the Contract Drawings, details of departures and reasons therefore shall be submitted as soon as practical for written approval, and the piping, ductwork, fixtures or equipment affected shall not be installed until approval is received.
- N. Reference to Drawing Schedules:
 - 1. Refer to equipment schedule for unit identification number and corresponding capacity and design requirements.
 - 2. Wherever schedules or notes appear on the Drawings or in the specifications in which sizes and capacities of equipment are indicated, the equipment furnished and installed under this contract shall meet the following requirements under operating conditions.

1.04 DEFINITIONS:

- A. "Provide" shall mean "provide complete in place," that is, "furnish and install."
- B. "Piping" shall mean pipes, fittings, valves and all like pipe accessories connected thereto.
- C. Pressure ratings specified, such as for valves and the like, is the design working pressure and is for and with reference to the fluid which the device will serve.
- D. "Ductwork" shall mean ducts, plenums, compartments, casings or any like devices, including the building structure, which is used to convey or contain air.
- E. "Building Boundary" shall mean exterior building walls.

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- F. "Mechanical Work" shall mean all work specified and shown in the Division 23, "Mechanical," categories. Mechanical Work generally includes: Plumbing, and Heating, Ventilating, Air Conditioning.

1.05 CODES AND STANDARDS:

- A. All work, material or equipment shall comply with the requirements of codes, ordinances and regulations of the local Government having jurisdiction at the location of the work, including the regulations of serving utilities, and any participating Government agencies having jurisdiction.
- B. The latest editions of the following Specifications, Codes and Standards shall form a part of these specifications, the same as if herein written out in full, and all materials and installations include but not be limited to:
1. CMC (California Mechanical Code)
 2. ASHRAE (American Society of Heating, Refrigeration and Air Conditioning)
 3. UL (Underwriters' Laboratories, Inc.)
 4. AMCA (Air Moving and Conditioning Associates)
 5. California State Division of Industrial Safety
 6. SMACNA HVAC Duct Construction Standards
 7. CBC (California Building Code)
 8. NFPA (National Fire Protection Association)
 9. San Diego County Codes
 10. California Administrative Code, Title 24
 11. Requirements of the State Fire Marshall
 12. National Electrical Code
 13. ASTM (American Society for Testing and Materials)
 14. AGA (American Gas Association)
 15. OSHA
 16. CPC (California Plumbing Code)
 17. CEC (California Energy Code)
- C. No requirement of these drawings and specifications shall be construed to void any of the provisions of the above standards. No apparatus, equipment, device or construction shall be installed which will provide a cross connection permitting any backflow or siphonage from any source into the domestic water supply system.

1.06 PERMITS AND FEES:

Obtain all permits, patent rights, and licenses that are required for the performing of the work by all laws, ordinances, rules and regulations, or orders of any officer and/or body, give all notices necessary in connection therewith, and pay all fees relating thereto and all costs and expenses incurred on account thereof. No work shall be covered before inspection by the jurisdictional authority and the Architect.

1.07 SUPERVISION AND COOPERATION:

- A. The Contractor shall include the services of experienced superintendents for each sub-section who shall be constantly in charge of the work, together with the qualified journeymen, helpers, and laborers, required to properly unload, install, connect, adjust, start, operate and test the work involved, including equipment and materials furnished by others.
- B. The work under this section shall be in cooperation with the work of other trades to prevent conflict or interference and to aid rapid completion of the overall project.

1.08 PROJECT SITE VISIT:

Periodic visits to the project site by the Engineer are for the expressed purpose of verifying compliance with the contract documents. Such site visits shall not be construed as inspections, construction supervision, i.e., the Engineer assumes no responsibility for providing a safe place for the performance of the work by the Contractor or the Contractor's employees or the safety of the supplies of the Contractor. Neither shall such site visits relieve the Contractor of the responsibility for the discovery of their own errors and the correction of them, nor of the responsibility of properly performing the work.

1.09 COORDINATION:

- A. The Contractor shall be responsible for providing all information, drawings or layouts of equipment or work under this section which affect the work of the other trades.
- B. In case changes in the indicated locations or arrangements are necessary due to developed conditions in the construction, or rearrangement of furnishings, or equipment, these changes shall be made without extra cost to the Owner, provided the change is ordered before work directly connected is installed, and no extra materials are required.

1.10 EXISTING UTILITIES:

- A. The location of utilities shown on the plans is the best-known information available at time of design. The Contractor shall contact the appropriate agencies and confirm the information and make arrangements for connection thereto, prior to excavation and installation of any piping or systems.
- B. Prior to installation of any waste and soil lines the Contractor shall physically verify whether the building sewer can be installed and properly connected to the sewer main. Any work requiring added expense which is caused by the Contractor to make such physical verification shall be borne by the Contractor.

1.11 UTILITY SERVICES DURING CONSTRUCTION:

All water and electric power used for construction shall be paid for by the Contractor.

1.12 SUBMITTALS AND SHOP DRAWINGS:

- A. Equipment and materials shall be submitted to the Architect for approval within 30 days after award of Contract and prior to fabrication or purchase of equipment and materials.
- B. Installation of materials or ordering of equipment prior to approval of submittals is done entirely at the risk of the Contractor.
- C. Unless otherwise specifically directed in the following specifications, the submittals by the Contractor to the Architect shall be as follows:
 - 1. Submit all items at one time in a neat and orderly manner as individual electronic, Portable Document Format (PDF) indexed files. A partial submittal will not be acceptable.

2. Reference catalog cuts and brochures of products to proper paragraph in specifications. Furnish numerical index by specification article number, listing product name, catalog number and reference to page number of submittal brochure.
 3. Cross reference individual catalog numbers of substitute products to number of specified materials.
 4. Submit manufacturers' certification that equipment meets or exceeds the minimum requirements as specified.
 5. Where materials, equipment and installations are specified to conform with societies or agencies such as ANSI, ASHRAE, SMACNA, etc., submit certification of such compliance.
 6. The submittal shall be complete and with manufacturer's selection data and information properly tagged to match equipment schedules and marked to show, among other things, material capacity and performance to meet capacities or performance as specified or indicated. Arrange the submittals in the same sequence as the specifications and reference in the upper right-hand corner, the particular specification provision for which each submittal is intended. Incomplete submittals will be rejected.
 7. If the Contractor submits a product that is specified, a complete set of brochures, rating tables, etc., is still required for future reference.
 8. Review of the submittal is only for general conformance with design concept of project and general compliance with information given in the contract documents. The Contractor is responsible for confirmation and correlation of the dimensions, quantities and sizes, for information that pertains to fabrication methods or construction techniques, and for coordination of work of all trades. Deviations from drawings and specifications shall be clearly and completely indicated (by a separate letter) in the submittal.
 9. For items, which are not manufactured, and which have to be specifically fabricated, including drawings and typical duct construction and complicated portions of ductwork as electronic, Portable Document Format (PDF) files and detail description shall be submitted. Shop drawings shall be submitted with such promptness as to allow ample time for examination and any re-submittal.
- D. For duct and piping shop drawing development, the contractor shall obtain the most current architectural, structural and electrical CAD/Revit files. Files shall be overlaid on to mechanical duct and piping shop drawings files using Navisworks by Autodesk for clash detection by the contractor's BIM Coordinator.

1.13 SUBSTITUTIONS:

- A. Substitution of an article, device, product, material, fixture, form or type of construction, other than those specified by name, make or catalog number is not permitted before the bid date. The contractor awarded the project, may propose substitutions as part of the submittal package as value engineering items. Written approval cannot be finalized until submittals are examined and credit to the owner is established.
- B. It is the responsibility of the contractor to coordinate substituted materials and equipment with all trades. If the use of substituted equipment results in an increase in the cost, including the work of other trades, the Contractor shall be solely responsible for payment of said increase in cost.

1.14 GUARANTEE:

- A. In addition to the guarantees required elsewhere, all work, materials and equipment provided under the mechanical sections shall be guaranteed for a period of one year from the date of acceptance of the work by the Owner. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall immediately furnish all necessary labor and materials to correct the trouble without cost to the Owner. The Contractor, under this guarantee, shall be responsible for all damages to any part of the premises caused by equipment furnished under this section.
- B. Furnish written certified guarantee, in acceptable form, to the Owner, against defective workmanship, materials and operating equipment. Further guarantee to rebalance and adjust entire system, or any part thereof as required for perfect operation for a period of at least one year after acceptance. Compressors shall have five-year warranty. Repair, replace and make satisfactorily operative any and all defective items and work, holding the Owner free from any cost and liability in connection therewith, for the term of the guarantee.

1.15 INTERRUPTION OF SERVICES:

- A. Existing services required to stay in operation in areas not remodeled shall be maintained rerouted or otherwise provided with temporary connection to prevent interruptions.
- B. If impossible to prevent interruptions, they shall be performed during "off-hours" and coordinated with the Owner's Representative.
- C. Provide a minimum of seven (7) days written notice of interruption. Do not interrupt services without written consent of the Owner.

1.16 DAMAGE BY LEAKS:

The Contractor shall be responsible for damage to the grounds, walks, roads, buildings, furnishings, piping systems, electrical systems and their equipment and contents, caused by leaks in the piping systems being installed or having been installed herein. They shall repair at their expense all damage so caused.

1.17 EMERGENCY REPAIRS:

The Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding the Contractor's guarantee bond nor relieving the Contractor of his responsibilities.

1.18 DEMOLITION:

- A. Demolition, capping and rerouting shall be performed as shown and as required to accommodate new construction.

PART 2 – PRODUCTS

The specification of the mechanical products is detailed in the individual specification sections of Division 23.

PART 3 – EXECUTION

3.01 INSTALLATION INSTRUCTIONS:

- A. The requirements of "mechanical" installation is detailed in the individual specification sections of Division 23. In addition, the following general requirements shall apply:
 - 1. Obtain Manufacturer's printed installation instruction to aid in properly executing work of installing equipment whenever such instructions are available. Submit three copies of such instructions to the Architect prior to time of installation for use of supervising the work.
 - 2. Erect equipment in a neat and workmanlike manner. Align, level and adjust for satisfactory operation. Install so that connecting and disconnecting of piping and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, maintenance and repair. Minor deviation from arrangements shown on drawings may be made, as approved by the Architect.

3.02 PROTECTION OF PIPING SYSTEMS:

- A. It shall be the responsibility of the Contractor to install and maintain pipe and equipment which is reasonably clean and free from rust, dirt, scale, etc. Where necessary, the Contractor shall provide temporary airtight covers at all pipe and equipment openings.
- B. Before turning the systems over to the Owner, all piping systems shall be thoroughly flushed of all scale and dirt. Drains shall be installed at the low points to facilitate flushing of the piping systems.

3.03 PROTECTION OF AIR HANDLING SYSTEMS:

- A. The Contractor shall continuously maintain adequate protection to keep dirt and foreign matter from getting into the air handling system.
- B. Ductwork and equipment shall not be left open for any extended period of time. Open section and open fittings shall be capped wherever they occur until such time as final connections are made to equipment, grilles, register, etc. as required by SMACNA IAQ Guidelines.

3.04 PROTECTION OF ELECTRICAL SYSTEMS:

Do not route liquid filled pressure and drain piping over electrical equipment, switchboards motor control centers and the like. When unavoidable, install galvanized drain pans to prevent liquid from dripping or squirting onto such equipment.

3.05 EXCAVATION AND BACKFILL:

- A. See "Earthwork" section of the specifications for requirements. In addition, the following shall apply:
 - 1. Execute all excavation to grades to accommodate elevations indicated and where invert elevations are not indicated, provide minimum coverage (above top of pipes) as follows:
 - a. Any piping under building slab (top of pipe to underside of slab) 18-inches.
 - b. Steel, cast iron, and copper in other locations 30-in.
 - c. Clay and Plastic piping in other locations - 36-in.
 - 2. Excavation for pipes shall be cut a minimum of six-inches below the required grade. A six-inch bed of sand or other approved material shall be then placed and properly compacted to provide an accurate grade and uniform bearing throughout the length of the pipe, except for plastic piping for which sand shall be used.

3. Sand used shall be washed river sand normally used for backfill purposes, free of clods or lumps of clay, rock, debris and rubbish.
4. Backfilling shall not be placed until the work has been inspected, tested and approved.
5. PVC piping excepted, backfill to point 12-inches above top of piping with fine earth (excavated material may be used) free of excessive amounts of clay, debris, rubbish, rocks, or clods, as approved by the Architect. Backfill above 12-inches from top of piping may be with excavated material. Apply backfill by hand in 6-inch deep layers the full width of the trench. Moisten each layer (do not flood or puddle), and hand tamp to a minimum 90 percent compaction before proceeding with the next layer of backfill. Note: PVC piping shall be backfilled with sand to a point 12-inches above top of piping, remainder of trench may be backfilled with fine earth as specified above.
6. Clods or lumps one-inch in size or larger will not be permitted in the backfill. If the excavated material is not suitable adequate material shall be provided by hauling from other locations.
7. Surplus earth or material remaining after backfilling shall be removed from the site as indicated in Section entitled "Earthwork."
8. Do not excavate under or near foundations or footings except in manner permitted and approved by the Architect. Do not backfill until installed piping has been successfully tested and approved for backfill by the jurisdictional inspector and the Architect.

3.06 RECORD DRAWINGS:

- A. The Contractor shall keep an accurate dimensional record of the as-built locations of all work under this Contract. This record shall be kept up-to-date at all times on blue line prints or an electronic set of plans as the job progresses and shall be available for inspection at all times.
- B. Upon completion of the work, the contractor shall obtain from the Architect CAD/Revit files of the applicable contract documents. All changes and information contained on the Record Drawings shall be transferred to the new CAD/Revit files.
- C. The Contractor shall submit one electronic, Portable Document Format (PDF) files and one CAD/Revit set of files, of the completed reproducible Record Set for approval. Make such changes and correction as may be required for final approval.
- D. When final approval is received, sign the reproducible Record Set and stamp or note "As-Built" and submit to the Architect.
- E. Final observation will not be made until these approved as-built drawing files have been received by the Architect.

3.07 CUTTING AND PATCHING:

- A. Perform all cutting and fitting required for work of this Section in rough construction of the building.
- B. All patching of finished construction of building shall be performed under the section of specification covering these materials.
- C. All cutting of concrete work by this Contractor shall be by core drilling or concrete sawing. No cutting or coring shall be done without first obtaining the permission of the Architect.

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- D. Information regarding requirements for openings, recesses, chases in the walls, partitions, framing or openings shall be provided for work under the appropriate sections of the specifications in advance of the work. Should this be neglected, delayed or incorrect and additional cutting is found to be required, this work shall be accomplished at no additional cost to the Owner.
- E. All access panels shall be approved by the Architect as to location, appearance, and finish.

3.08 VIBRATION ELIMINATION AND CONNECTORS:

Rotating or reciprocating mechanical equipment shall be mounted on or suspended from vibration isolators to prevent vibration and structural borne noise transmission to the building. Refer to each mechanical trade section of these specifications for specific details. Flexible duct connection shall be used between all fan openings and sheet metal work. Flexible connectors shall be used in piping connections to rotating or reciprocating equipment. See individual mechanical sections for specifications.

3.09 REQUIREMENTS FOR FINAL INSPECTION:

- A. All of the following items must be completed prior to final inspections. No exception and no final payment will be made until all items are completed and approved. For specific requirements see the individual section in the Division 23 Category.
 - 1. Cleaning equipment and premises
 - 2. Test and balance of systems
 - 3. Test and balance reports are reviewed by the Engineer
 - 4. Service manual
 - 5. Pipe and valve identification
 - 6. Pipe and valve identification schedule
 - 7. Operation tests
 - 8. Operating instructions
 - 9. As-built drawings
 - 10. CALGreen and Title-24 Acceptance forms

3.10 EARTHQUAKE RESTRAINT:

- A. General:
- B. All earthquake resistant designs for mechanical equipment, such as air handling units, water heaters, blowers, motors, ductwork, mechanical and plumbing piping, shall conform to the regulations of the California Building Code.
- C. The restraints which are used to prevent disruption of the function of the piece of equipment because of the application of the horizontal force shall be such that the forces are carried to the frame of the structure in such a way that the frame will not be deflected when the apparatus is attached to a mounting base and equipment pad, or to the structure in the normal way, utilizing the attachments provided. Equipment, piping, ductwork, etc. shall be secured to withstand a force in any direction equal to the value stated in the CBC for Commercial Buildings and the CAC for Healthcare Facilities, Schools, and Public Buildings.
- D. Piping:

1. All HVAC and Plumbing piping shall be secured by bracing at every fourth hanger transversely and every eighth hanger longitudinally. Bracing shall be done in accordance with the NFPA Code, and as described in paragraph "Sway Bracing for Protection against Earthquakes," of that code.
 2. As approved by code authority, the SMACNA "Guidelines for Seismic Restraints of Mechanical Systems" may be used as a guide.
- E. No sway bracing is required for pipes that are installed on very short hangers (12-inches or less).
- F. As approved by the code authority a bracing system as manufactured by "Superstrut" or "Pipe Shields Inc." may be used.

3.11 ADJUSTMENTS OF SYSTEMS AND OPERATION TESTS:

- A. When the work included in these specifications is complete, and at such time as directed by the Architect, the Contractor shall adjust all parts of the systems, advising the Architect when this has been done and the work is ready for their final tests. Refer to "Balancing and Testing Procedures" in Section 23 00 00.
- B. The Owner may require operation of parts or all of the systems prior to final acceptance. If it becomes necessary for temporary use of the systems before all parts are complete, the Contractor shall adjust all parts as far as possible in order to make such temporary use as effective as possible. After temporary use and before acceptance tests, all systems shall be readjusted to meet permanent operational requirements. This occupancy shall not be construed as final acceptance cost of utilities for such operation will be paid by the Owner.
- C. Operation Test and Instruction:
1. After final acceptance, the Contractor shall operate all mechanical systems and provide operational instructions for a period of at least one eight-hour day to demonstrate fulfillment of the requirements of the contract. During this time, all adjustments shall be made to the equipment until the entire system is in satisfactory operating condition acceptable to the Architect.
 2. Final Operation Instructions: Contractor shall place a competent person at the building who shall operate the systems instructing the Owner's Representatives in all details of operation and maintenance.
 3. Any required instructions from manufacturer's representatives shall be given during this period.
 4. All arrangements for operation and instruction periods shall be made through the Architect.
- D. For specific requirements see individual Mechanical Sections.

3.12 RUBBISH REMOVAL AND CLEANING:

Upon completion of the work under this section, the Contractor shall remove all surplus materials, equipment and debris incidental to their work, and leave the premises clean and orderly.

3.13 SERVICE:

Ninety (90) days free service shall be provided after completion of the job including changing of filters. Replacement filters shall be provided by the Owner and shall be on the job site.

3.14 PAINTING:

- A. Excepting piping identification specified in the specific section all painting is specified in the Painting Section of the Specifications.
- B. Surfaces to be painted shall be cleaned of cement, plaster and other spills.
- C. Factory finishes shall be repaired to original condition when scratched or dented.

END OF SECTION

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SECTION 23 30 00

HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.01 SUMMARY:

- A. The responsibilities of the Contractor shall include the following systems and equipment complete, and any additional work shown on the drawings or hereinafter specified.

Air Cooled Condensing Units
DX Fan Coil Units
Rooftop Packaged Heat Pumps (DOAS)
Exhaust Fans
Variable Refrigerant Flow (VRF)
Ductwork
Duct and Pipe Insulation
Air Distribution
Vibration Isolation
Automatic Temperature Control
Test and Balance

- B. The Contractor shall provide all sheet metal work as shown on the drawings or as required for the mechanical systems. Sheet metal work shall be as specified in this section.

1.02 GENERAL REQUIREMENTS:

- A. Reference to Other Sections: The applicable requirements from the following sections shall form a part of the heating, ventilating and air conditioning work and the Contractor shall consult them in detail for general and specific requirements.

Section	23 00 00	General Requirements Mechanical
	22 04 00	Plumbing
	23 34 43	Vehicle Exhaust Removal

1.03 RELATED WORK:

- A. The following work will not be furnished under this section of the specifications but will be furnished by other trades.
1. Power voltage wiring and connections thereto and all power voltage conduit.
 2. Openings in walls, floor, roofs.
 3. Louvers in doors and building walls.
 4. Concrete work.
 5. Cutting, patching and furring.
 6. Flashing.
 7. Final painting.
 8. Equipment foundation pads and platforms.
 9. Gas and condensate piping.

1.04 SHOP DRAWINGS:

- A. Contractor shall provide in electronic, Portable Document Format (PDF) fully dimensioned shop drawings for all specified equipment, controls and ductwork construction details. Manufacturer's equipment drawings are to be complete with capacity and sound level ratings as indicated in the drawings or specifications. Contractor shall also submit all manufacturer's internal wiring diagrams for electrical equipment and shall prepare other wiring diagrams showing the interlocking of the various controls and safety devices of the heating, ventilating and air conditioning systems. Submit performance curves for all fans (except propeller types and rooftop type) and for all water pumps 1 HP and larger. Equipment capacity tables requiring interpolation or extrapolation are not acceptable.
- B. Submit for approval, installation drawings which show exact dimensions and locations of openings required in floors, roofs and walls for ducts, air intakes and exhaust, roof exhausters, piping etc.
- C. For duct and piping shop drawing development, the contractor shall obtain the most the current architectural, structural and electrical CAD files to be overlaid on to mechanical duct and piping shop drawings.

1.05 FILTERS:

- A. A complete set of filters shall be supplied for use during the construction, testing and balancing period. A complete set of new filters shall be installed after testing and balancing.

1.06 EQUIPMENT START-UP:

- A. Provide the services of manufacturer's factory-trained service representative to start-up VRF system. Include in start-up, testing controls, demonstration of compliance with requirements, and replacement of damaged or malfunctioning controls and equipment.

PART 2 - PRODUCTS

2.01 DUCTWORK AND ACCESSORIES:

- A. Supply ducts, return ducts, and exhaust ducts, plenum chambers, housing, panels, unless otherwise specified herein or on the drawings, shall be fabricated from zinc-coated (galvanized) steel sheets conforming to the latest ASTM specification A-653. Zinc-coating shall be of the "Commercial" class. Where gauge numbers of metals are indicated or specified, they shall represent the manufacturer's standard gauge numbers, prior to galvanizing.
- B. Exposed Ductwork: All exposed ductwork shall be free from dings and dents. All rectangular and round ductwork shall have Ductmate System connections. All exposed round ducts shall be spiral type duct and shall be installed so seams line up at connections to appear as a single duct run. All exposed ductwork shall be supported using threaded rods. Sheet metal straps are not acceptable. All exposed duct fittings (i.e., elbows, branch tees, etc.) shall be two gages heavier than the duct they are connected to.

C. Volume Dampers:

1. Damper blades shall be manufactured of 16-gauge sheet metal.
2. Rectangular dampers shall be opposed blade type. Frame shall be 16-gauge galvanized steel. Where dimensions of duct exceed 18" x 12", blades shall not be over 8" wide. Bearings shall be provided; holes punched in ductwork to serve as bearings will not be accepted. Locking quadrant sizes shall be as follows: Up to 40 square-inches shall be 1/41 quadrant; up to 18" x 12" shall be 3/8" quadrant, and over 18" x 12" shall be 1/2" quadrant.
3. Round dampers up to 9-inch diameter may be installed in sheet metal spin fittings when used for balancing air distribution devices. Frames for dampers 10-inch diameter and above shall be 16-gauge galvanized steel. Dampers above 20-inch diameter shall be reinforced. Quadrant sizes shall be as follows: up to 9-inch diameter shall be 1/4-inch quadrant, 10-inch through 20-inch diameter shall be 3/8-inch quadrant, and over 20-inch diameter shall be 1/2-inch quadrant.

D. Fire Dampers Assemblies: Furnish and install all fire damper assemblies as required by the NFPA Pamphlet 90A and local authorities having jurisdiction. The dampers shall be approved and listed by the State of California Fire Marshal. Dampers shall be Style B curtain type complete with fusible link with 160 degree rating. Manufacturer shall be Pottorff, Ruskin, or Greenheck.

E. Fire/Smoke Assemblies: Furnish and install all fire and smoke damper assemblies as required by the NFPA pamphlet 90A and local authorities having jurisdiction. Dampers shall be complete with damper actuator activated by duct mounted smoke detector or firestat. (Projects with central fire control panel shall have dampers provided with two damper position switches linked to damper blade.) The damper assembly, including actuator, shall be approved and listed by the State of California Fire Marshal. Manufacturer shall be Pottorff, Ruskin, or Greenheck.

F. Flexible Connectors: Furnish and install connections at the point where ductwork casing connects to fans, and where shown on the drawings. Connectors shall be manufactured by Duro Dyne. Indoor flexible connectors shall be Neoprene #1 0003 MFN metal fab. Outdoor flexible connectors shall be Durolon #10002 MFD metal fab. Connectors shall be securely clamped to ductwork, fans and apparatus by means of bolted metal straps.

G. Flexible Ducts:

1. Flexible ducts shall consist of an exterior reinforced laminated vapor barrier, fiberglass insulation, encapsulated spring steel wire Helix and impervious smooth, non-perforated interior vinyl liner. Individual lengths of flexible ducts shall contain factory fabricated steel connection collars.
2. Flexible ducts shall be supported at or near mid-length with 2" wide, 28 gauge steel collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets. The maximum length shall be 5 feet and can be used at the terminal ends only, except that flexible ducts may be used to cross seismic joints without offsets.
3. Insulated low pressure flexible duct shall be Thermaflex type M-KE or approved equal.

2.02 REFRIGERANT PIPING AND ACCESSORIES:

- A. Refrigerant piping shall be seamless copper tubing, hard drawn, type K or L, conforming to ASTM B88.
- B. Fittings for copper tubing shall be wrought copper or bronze solder joint fittings conforming to ANSI B16 22.

- C. Moisture and liquid indicators shall be Sporlan See-All or equal for sweat joints. Refrigerant piping 2" and small shall have full line size indicators, and piping over 2" shall have the indicators mounted in "O.D." bypass as recommended by manufacturer.
- D. Driers shall be Henry, Superior, or equal angle cartridge flanged type with solder connection and required drier cartridges for each unit.
- E. Strainer for refrigerant piping shall be Henry, Superior or equal angle or "Y" pattern with 100 mesh Monel screen reinforced with 10 mesh brass screen or equal.
- F. Valves 1 $\frac{3}{8}$ " O.D. and above shall be Henry, Superior, or equal, bronze alloy.
- G. Valves 1 $\frac{1}{8}$ " O.D. and below shall be Henry, Superior, or equal, packless shut-off type.
- H. Solenoid valves shall be Sporlan or equal for sweat or screw joint connections as required. Coil housing shall have conduit connection. Valve shall be Underwriters' Laboratories and CSA approved.
- I. Expansion valves shall be Sporlan or equal thermostatic type with removable power element, external equalizer connection, external adjustable super heat and remote bulb. Valve capacity shall be equivalent to or slightly exceed the tonnage of the system. Valve selection shall be in accordance with the manufacturer of the condensing equipment.

2.03 CONDENSATE PIPING:

- A. All condensate drain piping and gas piping will be furnished and installed by Plumbing Contractor. Mechanical Contractor shall coordinate location and size of pipe connections with Plumbing Contractor.

2.04 INSULATION:

- A. Install thermal insulation on clean, dry surfaces after testing, inspection, and approval in strict accordance with these specifications, applicable drawings and contract documents and manufacturers' recommendations. Except for materials listed below, all insulation and accessory materials are to meet NFPA requirement of flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by Procedure ASTM-E-84, NFPA 225, or UL 723.
 - 1. Excepted are:
 - a. Flexible, closed cell, foamed plastic insulation (Armacell or approved equal) on water chilling units, copper tubing refrigerant piping, copper tubing runouts and drain lines only.
- B. Duct Insulation: Insulate all concealed supply and return air ducts with flexible glass fiber insulation with factory applied reinforced foil kraft facing, Manville R-series Microlite FSKL or approved equal. 1 $\frac{1}{2}$ " minimum thickness, density 2.0 pcf. Installed "R" value of 4.2 in conditioned space and 8.0 in non-conditioned space.
- C. Duct Liner: Ducts, where shown on the drawings shall be lined with 1 $\frac{1}{2}$ " minimum thickness, density 2.0 pcf, Manville "Linacoustic" or approved equal. The insulation shall not exceed k = .28 at 75°F mean temperature, installed R-value shall be 4.2 in conditioned space and 8.0 in non-conditioned space.

- D. Refrigeration suction piping shall be insulated with ¾" thick "Armacell" by Manville or approved equal. Exterior pipe insulation shall be protected with aluminum jacketing.
- E. All VRF piping insulation shall be in accordance with manufacturer's recommendations and comply with CMC and CEC – latest adopted editions.

2.05 EQUIPMENT:

A. Air-Cooled Condensing Unit:

1. Furnish and install an air-cooled condensing unit in the location and manner shown on the plan. The unit shall be properly assembled and tested at the factory. Units shall be Daikin or approved equal.
2. The unit shall operate down to 20°F outdoor air temperature entering condenser with standard controls.
3. Condenser coil shall be of nonferrous construction. Coil shall have aluminum plate fins, mechanically bonded to seamless copper tubes. Coil shall be circuited for subcooling. Coils require a phenolic coating for coastal protection.
4. Condenser Fans and Motors: Unit shall be furnished with direct-drive, propeller- type fans arranged for vertical discharge. Condenser fan motors shall have inherent protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard. Controls shall be included for cycling fan(s) for intermediate season operation.
5. Compressor(s): Each shall be of serviceable hermetic design with external spring isolator and shall have an automatically reversible oil pump - compressor shall unload in response to suction pressure. Compressor shall be located in a section separated from condenser fans and coil. Multiple compressor units shall have step-start fans and coils. Compressor motor(s) shall have (part-winding start), (across-the-line start).
6. Controls shall be factory wired and located in a separate enclosure. Safety devices shall consist of high- and low-pressure switches and compressor overload devices. Unit wiring shall incorporate a positive acting timer to prevent short cycling of compressor if power is interrupted. Timer shall prevent compressor from restarting for approximately 5 minutes after shut-off.
7. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel.

B. DX Fan-Coil Unit:

1. Unit construction shall be of heavy-gage, mill-galvanized steel panels, interlocked for ease of service. Panels shall be fully insulated with fire-retardant material in accordance with NFPA 90A. Units shall be Carrier or approved equal.

2. Refrigerant coils shall have aluminum fins mechanically bonded to copper tubes for high thermal efficiency. Coils shall be factory pressure-tested and shall have suction and discharge connections on the same end. Condensate drain pan shall extend under entire coil area and no modification to drain pan shall be required for horizontal or vertical applications. Evaporator fan section shall have one forward-curved, double inlet fan operating from a common shaft. Fan shaft shall be coated with Cosmoline or equivalent hydrocarbon rust inhibitor. Fan wheels shall be statically and dynamically balanced at factory. Fan shafts and wheels shall be constructed of mill-galvanized corrosion-resistant steel and shall be selected to operate at least 25% below the first critical speed and designed for continuous operation at maximum rated fan speed.
3. Drive components shall be enclosed within units. Access to motor and drive shall be provided by a removable panel of adequate size for removal of fan wheel, motor and drive. All unit sizes shall have variable-pitch drive which shall consist of a solid cast-iron fan pulley, variable-pitch motor pulley and V-belt(s). Drive shall be selected with a service factor of 1.5, based upon motor horsepower.
4. Motors shall be UL-approved, NEMA frame ball-bearing, drip-proof motors. Internal thermal protection shall be provided on motors up to 5 horsepower.
5. Filters: MERV-13 rating.

C. Package Heat Pump (DOAS):

1. Unit shall be a single package cooling and heating with hot gas reheat. It shall be factory fabricated, wired, charged, and tested, ARI certified and UL labeled. Units shall be manufactured by Trane or approved equal.
2. Casing shall be constructed of galvanized steel, bonderized and coated with baked enamel. Supply air connection shall be bottom discharge.
3. The compressor shall be of the welded hermetic type with internal vibration isolation. Crankcase heaters shall be standard on all models. Compressor shall have a 5-year protection plan.
4. Coils shall be constructed with aluminum plate fins mechanically bonded to nonferrous tubing.
5. Fans and Motors: Supply Fan motor shall be direct drive type with factory installed Variable Frequency Drive.
6. Heat Exchanger shall be of sectionalized design and constructed of 20 gage chromized steel or 18 gage aluminized steel. Burners shall be of the slotted port type.
7. Controls: Cooling section shall be protected by a fusible plug. Compressor motor shall have both thermal and current sensitive overload devices. Heating controls shall consist of an automatic electric spark ignition system, pilot safety switch, limit switch, fan switch and an automatic gas valve.
8. Filters: 2" thick, MERV-8 rated pre-filter and 2" thick, MERV-13 rated final filter (NBS Dust Spot test.)

D. Exhaust Fans:

1. Roof Exhausters:

- a. Fan shall be Greenheck, Loren Cook, or approved equal of size and capacity as called for on drawings.
- b. Roof exhaust fans shall be of the centrifugal, direct driven type. Construction of the fan housing shall be of heavy gauge aluminum mounted upon a rigid support structure. The shroud shall have a rolled bead and internal structural members for added strength. The fan wheel shall be of the aluminum backward-curved centrifugal type with an inlet venturi for maximum performance. Wheels shall be dynamically and statically balanced. Motors and centrifugal wheels shall be mounted on vibration isolators. Motors shall be isolated from the exhaust airstream. Air for cooling the motor shall be taken into the motor compartment from a location free from contaminants. Motors shall be readily accessible for maintenance. All fans shall bear the AMCA Certified Performance Ratings seal for both air and sound performance.
- c. V-belt drive shall be as indicated on drawings, having rubber and fabric V-belt drives with horsepower ratings 150% of connected motor, cast-iron V-groove sheaves, adjustable motor sheave, full ball bearings mounted outside air stream, pre-lubricated motor, and drive and wheel assembly mounted on oil resistant rubber isolators.
- d. Normal horsepower rating shall be 110% of brake horsepower of fan. Motors shall be outside air stream. Motor shall be wired to approved horsepower rated disconnect switch located in motor compartment.

2. In-Line Fans:

- a. Fan shall be factory assembled with square housing for in-line mounting in duct. Fans shall be Greenheck or approved equal.
- b. Wheel shall be backwardly inclined centrifugal type constructed of steel or aluminum that has been statically and dynamically balanced.
- c. The housing shall be constructed of formed steel, square shaped, with factory applied finish. One of the sides shall be hinged and shall support the motor and wheel assembly allowing the assembly to swing out for cleaning and inspection.
- d. Drive shall be belt type. Motor shall be open drip-proof type with inherent thermal protection. Provide belt guard.
- e. Ratings shall be in accordance with the appropriate A.M.C.A. approved test codes and procedures and bear the A.M.C.A. certified rating seal.

3. Ceiling Exhaust Fans:

- a. Ventilator shall have steel housing finished in baked enamel and insulated with at least $\sim/2$ " acoustic insulation. Housing shall have adjustable mounting brackets.
- b. Automatic Backdraft Damper shall be located within duct connector and shall have cushioned stops to prevent clatter. Damper/duct connector and wiring adapter plate shall be adjustable for either horizontal or vertical installation.
- c. Blower shall be removable and shall have a centrifugal blower type wheel. All motors are to be lifetime lubricated type, mounted with neoprene torsion mounts to isolate vibration. RPM not to exceed number listed for each model.
- d. Air Delivery shall be no less and sound levels no greater than listed for each model. All air and sound ratings shall be certified by AMCA. Units shall be UL listed.

E. Variable Refrigerant Flow (VRF):

1. Heat Recovery – Variable Refrigerant Flow Outdoor Units.

a. System Description:

- 1) The heat recovery variable refrigerant flow system is a two-pipe system consisting of a single outdoor unit, multiple indoor units of various types and capacities, multiport distribution controllers (MDCs), individual or central indoor unit controls with on/off temperature settings, all connected by fully-insulated refrigerant lines utilizing factory-supplied, fully-insulated branching kits. Indoor units are connected to condensate piping that shall be terminated to the nearest drain point.
- 2) The system shall be fully capable of simultaneous heating and cooling operation as requested by the individual indoor zones that can consist of single or multiple indoor units.
- 3) The maximum number of connected indoor units shall not exceed 49.
- 4) The total connected indoor unit capacity shall range between 50 and 150% of the outdoor unit capacity.

b. Equipment:

- 1) General: Factory-assembled, single-piece, air-cooled outdoor unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and the multiple inverter-driven twin rotary compressors.
 - a) The maximum sound pressure rating for a single outdoor unit shall not exceed 66.2 dBA in cooling or heating. Sound pressure ratings are measured at a distance of 3.3 ft out and 4.3 ft up from the side of the outdoor unit.
 - b) The outdoor unit shall include an oversized accumulator to prevent liquid sagging.
 - c) The outdoor unit shall be protected by a high-pressure switch, high-pressure sensor, low-pressure switch, low-pressure sensor, fusible plug, PC board, and an inverter overload protector.

- d) The outdoor unit shall be capable of operating in cooling mode down to 5°F dry bulb ambient air temperature and down to -13°F wet bulb ambient air temperature in heating mode. For simultaneous heating and cooling, in heating main mode, the unit shall be capable of operating between 21°F and 64°F wet bulb ambient air temperature. For simultaneous heating and cooling, in cooling main mode, the unit shall be capable of operating between 23°F and 75°F dry bulb ambient air temperature.
 - e) The outdoor unit shall include a total oil management system that balances oil between compressors within a module and replenished compressor oil to the compressors in a module from the oil separator if required.
 - f) The outdoor unit shall be non-modular and not require twinning to create larger systems.
 - g) Unit shall be provided with a corner panel quick check board for simplified setup and diagnostics.
- c. Unit Cabinet:
- 1) Unit cabinet shall be constructed of pre-coated steel, finished on both inside and outside.
 - 2) Unit access panels shall be removable with minimal screws and shall provide full access to the compressors, fan, and control components.
 - 3) Compressors shall be isolated in a compartment and have an acoustic wrap to assure quiet operation.
 - 4) The outdoor unit control panel shall include a hinged cover for access to adjustable controls and a LED display for setup and diagnostics.
 - 5) Unit cabinet shall be capable of withstanding 500-hour salt spray test.
- d. Fans:
- 1) Outdoor fan shall discharge air vertically and be driven by a DC inverter variable-speed motor with 25 steps.
 - 2) Outdoor fan motor shall be totally-enclosed with permanently-lubricated bearings.
 - 3) Motor shall be protected by internal thermal overload protection.
 - 4) Fan blade shall be non-metallic and shall be statically and dynamically balanced.
 - 5) Outdoor fan shall be protected by raised metallic protective grille.
- e. Compressors:
- 1) Each outdoor unit module shall be equipped with inverter-driven asymmetrical scroll compressor(s). Six (6), 8, and 10-ton outdoor units shall utilize a single compressor; 12, 14, 16, 18, and 20-ton outdoor units shall utilize two compressors. 20L, 22, 24, 26, and 28-ton outdoor units shall utilize three compressors.
 - 2) Compressor shall be totally-enclosed in the machine compartment.
 - 3) Compressors shall be equipped with factory-mounted crankcase heaters.

- 4) Internal safety logic shall protect the compressor from over-temperature operation.
 - 5) Motor shall be suitable for operation in an R-410A refrigerant atmosphere.
 - 6) Compressor assembly shall be installed on rubber vibration isolators.
 - 7) To maximize compressor reliability, multiple compressors within a module shall be started and operated in variable patterns to ensure equal runtime on all compressors.
 - 8) To ensure maximum efficiency throughout the system operation range, no compressor is required to run at maximum speed under any condition.
- f. Outdoor Coil:
- 1) Coil shall be constructed of aluminum fins mechanically bonded to seamless copper tubes, which are cleaned, dehydrated, and sealed.
 - 2) The coil configuration shall be three-sided, with fourth side providing access panels for service and maintenance.
 - 3) The coil fins shall have a factory-applied corrosion resistant blue-fin finish.
- g. Controls and Safeties:

Operating controls and safeties shall be factory selected, assembled, and tested. The minimum control functions shall include the following:

- 1) Controls:
 - a) Compressor speed to match the refrigerant flow and capacity with the system requirements.
 - b) Outdoor fan motor speed for higher efficiency and lower sound.
 - c) Oil control for improved system reliability and comfort.
 - d) Electronic expansion valve control for precise control of the refrigerant distribution and accurate capacity management to avoid starving any units.
 - e) Control of compressor staging to maximize reliability and equalize runtime on all compressors.
 - f) Module control of compressor operation, compressor speed, and fan speed to maximize efficiency and reliability across the entire operating range of the system.
 - g) Control of the outdoor heat exchanger surface areas for maximum efficiency and comfort.
 - h) System shall be a capable, programmable refrigerant temperature reset to match building heating load and provide additional energy savings.
 - i) System shall be capable of adjusting target evaporation and condensation temperature based on indoor PMV position and outdoor temperature.

2) Safeties:

The following safety devices shall be part of the condensing unit:

- a) High-pressure switch
- b) Fuses
- c) Crankcase heater
- d) Fusible plug
- e) Over current relay for the compressor
- f) Thermal protectors for compressor and fan motor
- g) Compressor time delay
- h) Oil recovery system
- i) Over-current sensor
- j) Compressor suction and discharge temperature sensor
- k) Compressor suction and discharge pressure sensor

h. Electrical Requirements:

- 1) All sizes shall utilize 208/230-3-60 or 460-3-60 (V-Ph-Hz) field power supply.
- 2) Systems shall have separate field power supply to each module.
- 3) Two-core, stranded, shielded, twisted pair cable shall be required for communicating among outdoor and indoor units.
- 4) All power and control wiring must be installed per NEC and all local electrical codes.
- 5) Outdoor unit shall be single-point power connection up to 28 tons.
- 6) Unit shall be provided with hinged electrical panel for serviceability.

i. Refrigerant Piping and Line Lengths:

- 1) Piping connections shall be from the front or the bottom of the unit.
- 2) The unit shall be capable of operating with maximum connected refrigerant line lengths of 2642 ft (actual).
- 3) The outdoor unit shall have the ability to operate with a maximum height of 164 ft between the outdoor and the lowest indoor unit.
- 4) The maximum distance between the outdoor unit and the furthest fan coil shall not exceed 541 ft actual or 623 ft equivalent. No oil traps shall be required.
- 5) The system shall be capable of operating when the height difference between the upper and the lower fan coil is 98 ft.

j. Auxiliary Refrigerant Components:

- 1) All field-supplied copper tubing connecting the outdoor unit to the indoor unit shall use factory-supplied branching kits consisting of Y joints to ensure even refrigerant flow.
- 2) To ensure piping flexibility, the system shall allow having Y joints downstream of a multiport distribution controller (MDC).
- 3) A multiport distribution controller (MDC) will be required to regulate the flow of high-pressure hot gas or high-pressure liquid to the fan coil requiring heating or cooling.
- 4) Up to 16 fan coils may be connected to a single MDC.
- 5) The main MDC can be installed up to 360 ft from the outdoor unit.
- 6) MDCs can be installed up to 196 ft from the indoor unit.
- 7) MDCs shall be powered by a dedicated 208/230-1-60 field power supply.
- 8) MDCs shall require a drain connection.
- 9) MDCs shall include a painted galvanized steel enclosure and shall be tested prior to shipment.

2. Multiport Distribution Controller (MDC)

a. System Description:

Indoor multiport distribution controllers (MDCs) are matched with two-pipe heat recovery variable refrigerant flow (RF) outdoor unit. MDCs are required to regulate the flow of high-pressure hot gas or high-pressure liquid to the indoor units (IDUs) required to regulate heating or cooling. Main MDCs receive refrigerant from outdoor unit (ODU) and separate high-pressure gas from liquid. This refrigerant is then distributed to the Main MDC's indoor units, or to Dub MDCs, which can be installed to provide additional ports for indoor units.

b. Equipment:

1) General:

Indoor multiport distribution controller (MDC) shall include brazed-plate heat exchanger(s), electronic expansion valves (EXVs), solenoid valves, check valves, strainers at each IDU, and main piping port, temperature sensors, pressure sensors, and microprocessor control system. Main MDCs shall also include a gas-liquid separator.

2) Unit Cabinet:

Cabinet shall be constructed of pre-painted, zinc-coated, galvanized steel.

3) Piping:

MDCs shall be available in four sizes with 6, 8, 10, or 16 ports. Each indoor unit port shall be capable of serving indoor units of capacities up to 54,000 Btu/hr. For indoor units with capacities greater than 54,000 Btu/hr., two ports may be "twinning" together using Y-joints to provide the necessary refrigerant flow. MDC ports shall also be capable of being "split" with downstream Y-joints to serve up to three indoor units requiring the same mode.

Unit shall have condensate drain connection on either end for installation ease.

MDCs shall be capable of utilizing field-provided accessory full-port ball valves for system service, isolation, and future expansion.

MDCs can be installed up to 196 ft from the indoor unit.

a) Main MDCs:

A two-pipe connection with ODU shall be implemented. In Cooling Main Mode, MDCs receive high-pressure, mixed-phase refrigerant from ODU through high-pressure pipe and return low-pressure gas through the low-pressure pipe. In Heating Main Mode, MDCs receive high-pressure gas from the ODU through high-pressure pipe and return low-pressure mixed-phase through the low-pressure pipe.

Main MDCs can be installed up to 360 ft from the outdoor unit.

b) Sub MDCs:

Sub MDCs shall be supplied refrigerant by Main MDC. A three-pipe connection with Main MDC shall be implemented with dedicated pipes for high-pressure gas, low-pressure gas, and liquid.

c) MDC Combinations:

Heat recovery VRF system can support a maximum of one Main MDC and two Sub MDCs.

d) Controls:

The system shall be microprocessor-controlled to maintain precise refrigerant conditions for indoor units, whether they require heating or cooling. Controls shall modulate solenoid valves and EXVs to manage flow of refrigerant to IDUs, as well as sub-cooling of liquid via brazed-plate heat exchangers. MDC shall communicate with IDUs over two-core shielded twisted pair wire with individual "home run" plugs for each IDU. MDCs shall communicate with each other and ODU using a "daisy chain" configuration, also using two-core shielded twisted pair wire.

MDCs shall not require any port assignments and shall come with controls quick connects.

All control wiring from MDC shall follow the piping to each indoor unit.

e) Accessories:

Piping adapters shall be provided with MDCs as standard accessories to accommodate various pipe sizes among ODUs, MDCs, and IDUs.

f) Electrical Requirements:

MDC shall be powered by a dedicated 208/230-1-60 (V-Ph-Hz) field power supply.

3. Medium Static Indoor Unit

a. System Description:

Indoor, direct-expansion, medium-static ducted fan coils are matched with a heat pump or heat recovery VRF (variable refrigerant flow) outdoor unit.

b. Equipment:

1) General:

Indoor, direct-expansion, medium-static ducted fan coil. Unit shall be complete with coil, fan driven by DC motor, EXV (electronic expansion valve), piping connectors, electronic controls, microprocessor control system, and integral temperature sensing.

2) Unit Cabinet:

Cabinet shall be constructed of zinc-coated steel. The unit shall be capable of being configured for either bottom or rear return.

3) Fans:

Fan shall be of the multi-blade type with its performance designed to match the coil performance. The fan shall be statically and dynamically balanced to ensure low noise and vibration and capable of up to 0.6 in. wg external static pressure.

4) Coil:

Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion, and fins shall be coated with blue-fin finish for enhanced wettability and corrosion resistance. A drip pan under the coil shall have a factory-installed drain connection for hose attachment to remove condensate.

5) Motors:

Motors shall be totally enclosed, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be inverter controlled variable speed.

6) Controls:

a) The units shall be connected into a controls network with the other indoor units and outdoor units via a two wire 18GA stranded shielded control wire and shall have controls quick connections as standard.

b) The system shall be microprocessor-controlled to maintain precise room temperature and maximize efficiency.

- c) The units shall be capable of performing all initial settings from the remote controller without the need for adjusting physical dip switches.
- d) Unit shall come with IR receiver as standard
- e) The system shall include ACB (auxiliary control board) interface adjacent to the indoor unit control board. This ACB interface shall provide three dry contact outputs to indicate operation (on/off) status of fan, cooling mode, and heating mode. This interface shall also provide a fourth dry contact output to trigger auxiliary heat. Auxiliary heat output shall be configurable via wired controller with settings for temperature differentials and time delay.
- f) Any of the following user interface accessories shall be compatible with the unit.

- i. Wireless Remote Controller

All indoor units shall come with factory-installed IR (infrared) receivers to allow the use of wireless controller. Wireless controller may be used to set indoor unit address.

- ii. Wired Remote Controller (Non-Programmable)

Wired controller (non-programmable) shall communicate over 2 core shielded twisted pair wire up to 820 ft. It may be used as one per unit; or, it may be used in a daisy chain arrangement for group control of up to 16 units. The wired controller (non-programmable) shall be able to control settings for on-off, dual set point, mode, fan speed, louvered swing functions (for applicable indoor units), address, and set point temperature range limiting. The controller shall include a back-lit display and shall be capable of displaying system error codes.

- iii. Wired Remote Controller (Programmable)

Wired controller (programmable) shall communicate over 2 core shielded twisted pair wire up to 820 ft. It may be used as one per unit; or, it may be used in a daisy chain arrangement for group control of up to 16 units. The wired controller (programmable) shall be able to control settings for on-off, dual set point, mode, fan speed, louvered swing functions (for applicable indoor units), address, and set point temperature range limiting. The controller shall include a back-lit display and shall be capable of displaying system error codes.

The wired controller (programmable) shall be configurable with weekly schedule settings, and shall be available in two interfaces:

- Standard LCD display with touch buttons, or
- Color, touch screen display with resolution of 800 x 480.

iv. Centralized Controller (Touch Screen)

Centralized controller shall communicate over 2 core shielded twisted pair wire up to 3937 ft. The controller shall be wired directly to the header outdoor unit's "XY" centralized control communication bus. Centralized controller shall be able to manage up to 384 indoor units, for up to 20 users, with 3 levels of account management. The controller shall be able to control settings for on-off, dual set point, mode, fan speed, louvered swing functions (for applicable indoor units), address, and set point temperature range limiting. Controller shall be capable of displaying system error codes and configuring weekly schedules. The controller shall have a 10.1 inch color touch screen, with resolution of 1200x800.

7) Filters:

The cabinet shall be supplied with filter track and filter.

8) Electrical Requirements:

Indoor units are 208/230-1-60 (V-Ph-Hz).

4. Compact Ceiling Cassette Indoor Units (1-Way, 4- Way)

a. System Description:

Indoor, ceiling-mounted, direct-expansion indoor units are matched with heat pump or heat recovery VRF (variable refrigerant flow) outdoor unit.

b. Equipment:

1) General:

Indoor, direct-expansion, ceiling-mounted fan coil. Unit shall be complete with coil, fan driven by DC motor, EXV (electronic expansion valve), piping connectors, electrical controls, microprocessor control system, and integral temperature sensing.

2) Unit Cabinet:

Cabinet shall be constructed of zinc-coated steel. Fully insulated discharge and inlet grilles shall be attractively styled, high-impact non-metallic material. The inlet grille shall have hinges and can be opened to obtain access to the cleanable filters, indoor fan motor and control box.

3) Fans:

Fan shall be centrifugal direct-drive blower type with air intake in the center of the unit and discharge at the perimeter. Automatic, motor-driven vertical air sweep shall be provided standard.

4) Coil:

Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion, and fins shall be coated with blue-fin finish for enhanced wettability and corrosion resistance. A drip pan under the coil shall have a factory-installed drain connection for hose attachment to remove condensate. Unit shall be furnished with condensate lift mechanism with 27 ½ in of lift capacity.

5) Motors:

Motors shall be totally enclosed, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be inverter controlled variable speed.

6) Controls:

- a) The units shall be connected into a controls network with the other indoor units and outdoor units via a two wire 18GA stranded shielded control wire and shall have controls quick connections as standard.
- b) The unit shall be microprocessor-controlled to maintain precise room temperature and maximize efficiency.
- c) The units shall be capable of performing all initial settings from the remote controller without the need for adjusting physical dip switches.
- d) Unit shall come with IR receiver as standard
- e) The unit shall include ACB (auxiliary control board) interface adjacent to the indoor unit control board. This ACB interface shall provide three dry contact outputs to indicate operation (on/off) status of fan, cooling mode, and heating mode. This interface shall also provide a fourth dry contact output to trigger auxiliary heat. Auxiliary heat output shall be configurable via wired remote controller with settings for temperature differentials and time delay.
- f) Any of the following user interface accessories shall be compatible with the unit.

- i. Wireless Remote Controller

- All indoor units shall come with factory-installed IR (infrared) receivers to allow the use of wireless controller. Wireless controller may be used to set indoor unit address.

- ii. Wired Remote Controller (Non-Programmable)

- Wired remote controller (non-programmable) shall communicate over 2 core shielded twisted pair wire up to 820 ft. It may be used as one per unit; or, it may be used in a daisy chain arrangement for group control of up to 16 units. The wired remote controller (non-programmable) shall be able to control settings for unit on-off, dual set point, operating mode, fan speed, louvered swing functions (for applicable indoor units), set indoor unit address, and set point temperature range limiting. The controller shall include a back-lit display and shall be capable of displaying system error codes.

iii. Wired Remote Controller (Programmable)

Wired controller (programmable) shall communicate over 2 core shielded twisted pair wire up to 820 ft. It may be used as one per unit; or, it may be used in a daisy chain arrangement for group control of up to 16 units. The wired remote controller (programmable) shall be able to control settings for unit on-off, dual set point, operating mode, fan speed, louvered swing functions (for applicable indoor units), indoor unit address, and set point temperature range limiting. The controller shall include a back-lit display and shall be capable of displaying system error codes.

The wired remote controller (programmable) shall be configurable with weekly schedule settings, and shall be available in two interfaces:

- Standard LCD display with touch buttons, or
- Color, touch screen display with resolution of 800 x 480.

iv. Centralized Controller (Touch Screen)

Centralized controller shall communicate over 2 core shielded twisted pair wire up to 3937 ft. The controller shall be wired directly to the header outdoor unit's "XY" centralized control communication bus. Centralized controller shall be able to manage up to 384 indoor units, for up to 20 users, with 3 levels of account management. The controller shall be able to control settings for unit on-off, dual set point, operating mode, fan speed, louvered swing functions (for applicable indoor units), and set point temperature range limiting. Controller shall be capable of displaying system error codes and configuring weekly schedules. The controller shall have a 10.1 inch color touch screen, with resolution of 1200x800.

7) Filters:

Unit shall have factory-supplied resin net (cleanable) type filters.

8) Electrical Requirements:

Indoor units are 208/230-1-60 (V-Ph-Hz).

2.06 AIR DISTRIBUTION:

- A. Performance: Shall provide the required air throw and spread with no apparent drafts or excessive air movement within the air-conditioned area. Any air distribution accessories required to affect these conditions shall be provided and installed by the Contractor. Grilles, registers or ceiling diffusers causing excessive air movement, drafts or objectionable noise, shall be replaced at no cost to the Owner. Paint inside of all ducts including volume dampers, etc., behind registers and diffusers with two coats flat black enamel. Air distribution shall have a factory applied color to match the ceiling finish.
- B. Locations: All devices shall be installed in approximately the location indicated on the drawings, but the Contractor shall verify the exact locations at the building, and with the drawings, making any minor changes as may be required and as approved by the Owner.
- C. Air Distribution shall be "Titus" Manufacture or approved equal. See plans for model number and type.

2.07 AUTOMATIC TEMPERATURE CONTROL:

- A. Summary: The temperature control manufacturer as described under this heading shall furnish and install a complete system of automatic controls as shown on plans and as specified hereinafter. All control equipment shall be the product of one manufacturer and shall be basically of the electric type. Control equipment shall be Carrier. The control manufacturer shall have a representative sample of local jobs to validate performance and shall have a maintained a full-time local service organization for at least three years.
- B. The VRF system and split system in the comm room will be connected to the BAS system being installed on the City computer at their maintenance facility. Contractor to provide all materials and equipment on site necessary to allow full operation of systems (standalone) and connection of system to existing BAS system (if available) via internet connection in comm room.
- C. Drawings and Checkout: The Temperature Control Contractor shall submit shop drawings of the entire control system to the Architect for approval before starting work. The control system shall be completely checked out, adjusted and calibrated to perform all required functions for proper operation.
- D. Electrical Wiring: See paragraph 3.7 of this section.
- E. Smoke Detectors:
 - 1. The air duct smoke detector shall be of the photoelectric type.
 - 2. The detector housing shall be California State Fire Marshall listed (CASFM) and UL listed per UL268A, specifically for use in air handling systems.
 - 3. The detector shall operate at air velocities of 100' per minute to 4,000' per minute.
 - 4. The detector shall be capable of local reset button or remote test switch (RTS).
 - 5. The duct detector housing shall incorporate an airtight smoke chamber in compliance with UL268A, Standard for Smoke Detectors for Duct Applications.
 - 6. The housing shall be capable of mounting to either rectangular or round ducts without adaptor brackets.
 - 7. An integral filter system shall be included to reduce dust and residue effects on the detector and housing, thereby, reducing maintenance and servicing.
 - 8. Sampling tubes shall be either be plastic or be able to be installed after the housing is mounted to the duct by passing through the duct housing.
 - 9. The enclosure shall meet all applicable NEC and NFPA standards regarding the electrical junction boxes. Terminal connections shall be a strip and clamp method that is suitable for 12- 18 AWG wiring.
 - 10. Single or multiple systems supplying air in excess of 2,000 CFM shall be equipped with automatic shutoff. Automatic shutoff shall shut down the air-moving equipment then smoke is detected in the supply air. Detector shall be installed in the main supply duct or plenum.

2.08 MOTORS, DRIVES, GUARDS AND STARTERS:

- A. Motors shall be built to the specifications of the National Electric Manufacturer's Association (NEMA). The motor shall be ball bearing, drip-proof, squirrel cage induction type for full voltage start, to operate at speeds not to exceed 1750 rpm except when indicated otherwise. The motors shall be Lincoln, Electro Dynamic, Sterling, or approved equivalent. Motors mounted outdoors shall have encapsulated windings and have weatherproof hood. The minimum service factor shall be 1.15.

- B. Drives shall have one belt for units under 5 horsepower, at least 2 belts for units 5 horsepower to 25 horsepower, and 3 belts for units 25 horsepower and over. Belts shall be V-belt design sized for at least 150 percent of the motor horsepower. Motor pulleys shall be of the variable pitch up to 7-1/2 horsepower and fixed pitch type, 10 horsepower and larger. Pulleys shall be cast-iron with steel bushings. Provide additional new pulleys where required to drive fans at speeds necessary to give the indicated volumes. Belts shall be Bates, B.F. Goodrich, Goodyear or equal.
- C. V-belt drives for the fans shall be properly protected by metal guards. Guards shall be made of not less than 16 gauge expanded metal 1/2-inch mesh, on an angle iron frame so as to securely close in the top, bottom and both sides of the drive. Ample allowance shall be made in guard for motor and belt adjustment. The guard shall be provided with openings so that the rpm of the fans may be obtained. Guards on equipment outside of building shall be of weatherproof design.
- D. All guards shall be given a prime coat and one heavy coat of machinery gray enamel
- E. All guards shall conform to California General Industrial Safety Order Requirements
- F. Starters shall be reduced voltage "soft Start" for both motor starting and stopping, with overload protection on all legs. Starters shall be complete with NEMA Type I, enclosures with built-in "Hand-Off- Automatic" switch. Starters exposed to weather shall have NEMA Type 4 enclosure.

PART 3 - EXECUTION

3.01 DUCTWORK:

- A. Ductwork fabrication and installation shall conform to the recommendation of the latest edition of the duct construction standards as published by the Sheet Metal and Air conditioning Contractors National Association, Inc., (SMACNA). These standards shall govern type of seams and joints, reinforcing and supports, corner closures duct hangers, elbows, turning vanes (use double vane type), tapers offsets; streamliners, branches from mains, tee connections, volume dampers, access doors in ducts, fire damper installation, casings and housing. All unwrapped exposed ducts shall be cross-broken; beading will not be acceptable. Ducts that are wrapped shall be cross-broken or beaded.
- B. Volume dampers shall be caulked in the ducts to avoid bypass. Damper blade position on all dampers shall be indicated by filing a notch in the exposed operation rod or splitter damper rod. Volume control dampers shall be installed in all branch ducts, whether shown on drawings or not, to allow balancing of the system. Where damper frames and blades constitute an obstruction in excess of 15 percent of the duct area, the duct shall be increased in size to receive the damper.
- C. All supply, return, and exhaust duct joints shall be sealed airtight with approved mastic.
- D. All ductwork exposed to weather, regardless of system pressure classification, shall be sealed in accordance with Seal Class A, as referenced in SMACNA Standards. Sealant shall consist of Foil faced FG-701/Sealant System by HardCast.

3.02 PIPING INSTALLATION:

- A. Refrigerant Piping: Cut pipe accurately to measure established at the site and work into place without springing or forcing. Install piping with sufficient flexibility for expansion and contraction due to temperature fluctuation inherent in its operation. Where pipe passes through building structure, pipe joints shall not be concealed, but located where they may be readily inspected. Run all piping essentially as indicated and detailed on the plans, taking care to avoid interference with other piping, conduit or equipment. Run piping plumb and straight and parallel sleeves of suitable size for all lines passing through building structure. Braze refrigerant piping with silver solder complying with AWS A5.8. The inside of tubing and fittings shall be free of flux. Clean the parts to be joined with emery cloth and keep hot until the solder has penetrated the full depth of the fitting and the extra flux has been expelled. Cool joints in air and remove flame marks and traces of flux. During the brazing operation, prevent an oxide film from forming on the inside of the tubing by slowly flowing dry nitrogen to expel the air. Make provision to automatically return oil on halocarbon systems.
- B. Pipe Sleeves: Provide pipe sleeves for all pipes and tubing which penetrate the building structure. Sleeves shall be securely retained in position and location before and during construction. Space between pipe and sleeves, shall be not less than V4" between outside of pipe and inside wall of sleeves. Pack the annular space with hemp or fiberglass, and seal with elastic cement. Sleeves for uninsulated pipes shall have ends flush with finished wall surfaces and the pipe or tubing shall be provided as above, with outside perimeter of pipe caulked to the sleeve. Extend sleeves for lines passing through floors 3" above finished floor slab, and caulk to the slab. Provide lines passing through roof areas with necessary slashing and counterflashing to provide a water-tight roof seal.
- C. Leak testing upon completion of installation of the air conditioning equipment, test all factory as well as field refrigerant piping with an electronic-type leak detector to acquire a leak-tight refrigerant system. If leaks are detected at the time of installation or during the guarantee period, remove the entire refrigerant charge from the system, correct the leaks and retest the system.
- D. Evacuation, Dehydration, and Charging: After system is found to be without leaks, evacuate the system using an electronic gage with range accurate to 10 microns and a vacuum pump capable of pulling a vacuum of at least 1 mm Hg absolute. Evacuate system in strict accordance with the triple-evacuation and blotter method or in strict accordance with equipment manufacturer's printed instructions. System leak testing, evacuation, dehydration, and charging with refrigerant shall comply with ARI 260.

3.03 INSULATION INSTALLATION:

- A. Insulate no piping or equipment until tested and approved for tightness. All piping shall be dry when insulated.
- B. Ductwork Insulation:
 - 1. Supply Air Ductwork Above Ceiling: Secure insulation to duct with mechanical fasteners on 18" centers or on underside of rectangular ducts over 30" wide. Seal all joints, fastener penetrations and other breaks in vapor barrier with 3" wide strips of the same facing material adhered with vapor barrier adhesive, Manville Z-Glue or approved equal, or 3" wide strips of white glass fabric, Manville Duramesh Fabric No. 206 or approved equal, coated with vapor barrier mastic, Foster 30-35 or approved equal.
 - 2. Return Air Ductwork Above Ceiling: The insulation shall be wrapped entirely around the duct with all joints lapped at least 2" and secured with 16-gauge galvanized wire on 12" centers. The insulation shall cover all surfaces including standing seams.

3. Ductwork Liner: The duct liner shall be applied with 100% coverage of approved fire-resistant adhesive. On ducts over 20" wide or deep, the liner shall be additionally secured with mechanical fasteners on maximum 15" centers. Fasteners shall start within 2" of the leading edge of each section and within the duct section. All exposed edges and the leading edge of all cross joints of the liner shall be heavily coated with an approved fire-resistant adhesive. The duct liner shall be cut to assure snug closing corner joints, the black surface of the liner shall face the air stream, transverse joints shall be neatly butted, and all damaged areas shall be heavily coated with an approved adhesive.

3.04 EQUIPMENT INSTALLATION:

- A. The installation of all air conditioning equipment and exhaust fans shall be strictly in accordance with the manufacturer's instruction and installation book. All recommendations of manufacturer shall be followed, required clearances maintained, and factory approval secured for each installation. All equipment shall be securely fastened to its base. All parts of the installation shall be made weatherproof. A copy of the manufacturer's installation and service manual shall be kept with each piece of equipment at all times to allow an inspector to determine if the installation meets requirements.
- B. All work shall be performed by skilled mechanics, under the supervision of a competent foreman and in accordance with the best standards of practice of the trade.

3.05 ROOF AND WALL PENETRATIONS:

- A. All penetrations of roof and exterior walls shall be flashed watertight with lead or galvanized iron.
- B. Flashing shall comply with requirements for flashing in Sheet Metal Section.
- C. Pipe flashing shall be counterflashing sleeve type with 4 pound seamless lead flashing with 8" skirt. The joint shall be sealed with Permaseal water-proofing compound or equal.

3.06 IDENTIFICATION OF MECHANICAL EQUIPMENT:

- A. Equipment: Equipment shall be identified by stenciling the identification plainly (such as EF-1 as shown on equipment schedule) on the service side. Lettering to be minimum size of 1". This applies to fans, boiler, etc.

3.07 ELECTRICAL WORK:

- A. Power voltage wiring and connections thereto and all power voltage conduit shall be furnished and installed under the Electrical Division of the specifications.
- B. Low voltage and line voltage control wiring and connections thereto and all low and line voltage control conduit shall be furnished and installed under the Mechanical Sections of the specifications.
- C. Relays, push button stations, control equipment, etc., shall be furnished under the Mechanical Section of the specifications, except as noted on the drawings. Check drawings closely for starters that will be furnished under the Electrical Division which will be in Motor Control Panels. Magnetic motor starters, except those furnished with packaged mechanical equipment, will be furnished under Mechanical Division.
- D. Disconnect switches shall be furnished, installed and connected under the Electrical Division of the specification.

3.08 EARTHQUAKE RESTRAINT:

- A. Provide a means to prohibit excessive motion of all mechanical equipment during an earthquake.
- B. All mechanical equipment, both hanging and base mounted, shall be provided with mounting connection points of sufficient strength to resist lateral seismic forces equal to 0.5 of equipment operating weight.

3.09 SHOP PRIMING PROCEDURES:

- A. Ferrous metal items, except items to be encased in concrete and areas adjacent to field welds shall be thoroughly cleaned and prime painted.
- B. Surfaces shall be cleaned free of loose mill scale, loose rust, accessible weld slag or flux deposit, dirt and other foreign matter by hand wire brushing. Oil and grease deposits shall be removed by solvent.
- C. After cleaning, surfaces shall be given one shop coat of prime paint applied thoroughly and evenly to dry surfaces. Surfaces inaccessible after assembly or erection shall be given an additional shop coat of slightly different color than first coat.
- D. After erection, rough up with prime paint all members where shop coat has been damaged, welds and area adjacent to welds and field bolts.

3.10 TEST AND BALANCE:

- A. The Contractor shall furnish all labor, equipment and services necessary for and incidental to air and water systems testing and balancing.
- B. Include an extended warranty of one year after final acceptance by Owner, during which time the Owner may request a recheck or resetting of any outlet, coil or device listed in the test report. Provide technicians to assist in making any test or adjustment required.
- C. Contractor shall at his own expense, procure the service of an independent air balance and testing agency approved by the Owner, which specializes in the balancing and testing of heating, air conditioning and ventilating systems, to balance, adjust and test all air moving equipment, air distribution systems and exhausting systems as herein specified. All instruments used by this agency shall be accurately calibrated and maintained in good working order. If requested, the test shall be conducted in the presence of the Owner and/or his representative.
- D. Air balance and testing shall not begin until system has been completed and is in full working order. The Contractor shall put all heating, ventilating and air conditioning systems and equipment in full operation and shall continue the operation of same during each working day of testing and balancing. The Contractor shall submit, within fifteen (15) days after receipt of Contract, one copy of submittal data for the testing and balancing of the air conditioning, heating and ventilating systems. The air balance agency shall provide proof of having successfully completed at least five projects of similar size and scope and shall be a certified member of the Associated Air Balance Council and/or National Environmental Balancing Bureau and/or Testing Adjusting & Balancing Bureau (TABB) unless otherwise approved.

- E. Test and balance agency shall include an extended warranty of ninety (90) days after completion of test and balancing work, during which time the Owner, at his discretion, may request a recheck or resetting of any outlet, supply air fan, or exhaust fan as listed in test report. The agency shall provide technicians to assist the Engineer in making any test he may require during this period of time. Commissioning agent shall conduct "spot checks" on air distribution to verify air balancing.
- F. The Air Conditioning Contractor shall award the test and balance Contract to the approved agency upon receipt of his Contract to proceed with air conditioning installation, to allow the air balance agency to schedule this work in cooperation with other trades involved and comply with the completion date.
- G. Upon completion of the air conditioning system, the air balance agency shall perform the tests, compile the test data, and submit in electronic, Portable Document Format (PDF) the complete test data to the Contractor for forwarding to the Owners for evaluation and approval.
- H. The test and balance agency shall be licensed in accordance with one of the following methods:
 - 1. AABC National Standards for Total System Balance
 - 2. ACCA Manual B
 - 3. ASHRAE 111
 - 4. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems
 - 5. SMACNA HVAC Systems Testing, Adjusting and Balancing

3.11 OPERATING AND MAINTENANCE MANUALS:

- A. The Contractor shall provide in electronic, Portable Document Format (PDF) The following shall be included in the Manual.
 - 1. Identification: The Manual shall include the names, addresses and telephone numbers of each Sub-Contractor installing equipment and systems and of the local representative for each major item of equipment.
 - 2. Index: The Manual shall have a Table of Contents and information shall be assembled with tab sheets to conform to the Table of Contents.

3.12 OPERATING AND MAINTENANCE INSTRUCTIONS:

- A. Manufacturer's Literature: Manufacturer's instructions for operation and maintenance of all mechanical equipment, including replacement parts list.
- B. Written Instruction: Typewritten instructions for operation and maintenance of the system composed of Operation Instruction, Maintenance Instructions and Maintenance Schedule.
- C. Operation and Maintenance Instructions: A brief description of the system indicating proper setting of switches and other equipment shall be furnished for the purpose of providing control of the system and its components by the operator.
- D. Maintenance Schedule: A list of each item of equipment requiring maintenance, showing all the components of each item of equipment, and the month of the year (service schedule) when each item or component of equipment should be inspected or serviced, as recommended and

scheduled by the manufacturers.

- E. Verbal Instructions: Upon completion of the work, and at a time designated by the Owner, a competent Engineer from each supplier of major items or equipment shall be furnished to instruct the Owner's representative in the operation and maintenance of the equipment supplied by his company.
- F. Electronic files: A complete set of the above data along with control diagrams as installed, sequence of operations, complete catalog data, calibration information, spare parts lists, etc., for all control equipment shall be placed in electronic, Portable Document Format (PDF) files identification section and index. Provide three complete electronic, Portable Document Format (PDF) copies deliver to the Owner.
 - 1. Manufacturer's Literature: Include Manufacturer's literature for all mechanical equipment. All equipment shall be identified by make, model and serial number. Electrical characteristics shall be noted. A complete parts list shall be included.
 - 2. Operating Instructions: Provide a brief description of the system including proper setting of switches and other equipment. This may be provided as a part of the manufacturer's literature. If included in literature provide an index indicating on what page each item is located. Adjustments requiring the technical knowledge of the service agency personnel need not be included.
 - 3. Maintenance Instructions: Provide a list of each item of mechanical equipment requiring inspection, lubrication or service with a description of the schedule and performance of such maintenance including types of lubricant for each item of equipment. This may be provided as a part of the Manufacturer's Literature. If included in literature provide an index indicating on what page each item is located.
 - 4. Controls: Provide system control in electronic, Portable Document Format (PDF) including complete catalog data, calibration information, spare parts lists, etc. A sequence shall be included with the diagram referring to component numbers or designations hereon.

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SECTION 23 34 43

VEHICLE EXHAUST REMOVAL SYSTEM

PART 1 - GENERAL

1.01 SCOPE

- A. The bidder shall provide all labor, materials, and equipment necessary, to put in working operation a complete system to remove both diesel and automotive exhaust gases, and particulate of operating vehicles within the confines of specified fire station(s). All necessary controls, motors, fittings, louvers, ductwork, blower(s), labor and all other equipment and materials specified shall be part of the bidder's work. Bidder to confirm existing inventory with Plymovent representative.
- B. All items of equipment and materials described in these specifications are to be furnished installed and placed into proper operating condition in accordance with good practice and manufacturer's written or published instructions.
- C. All workmanship and materials shall be in accordance with applicable codes and regulations. (i.e. SMACNA, BOCA, NEC, ASTM, CBC, CMC, NFPA, and AMCA). Such codes and regulations are to be considered part of these specifications.
- D. The bidder shall warranty all materials, equipment and workmanship for a period of two (2) years from the date of final acceptance of the completed job, against original defects of material and workmanship, improper or insufficient maintenance, excessive wear and deterioration. Repairs shall be made at the bidder's expense.
- E. Bidder shall install a complete automatic disconnect Diesel Exhaust Removal System, that addresses the problem of diesel fumes in the fire department station house that will not interfere with normal day-to-day operations. The system shall be a Sliding Balancer Track type system that has the following performance criteria.
 - 1. The exhaust removal system must provide approximately 100% complete evacuation of all diesel fumes at the source from start up to exit of the apparatus from the fire station. The diesel exhaust removal system shall be capable of reaching to the undercarriage of the vehicle tailpipe located anywhere from 10 to 25 feet away from the exiting door. The system must be able to accommodate back in bays to meet all the needs of the fire department.
 - 2. The system must not affect personnel boarding the apparatus. Hose loops shall not hang any lower then seven feet from the bay floor. The hose assembly shall not touch or drag on the bay floor.
 - 3. The exhaust system shall not block doorways, exits, and aisles in the apparatus bay, which could endanger the welfare of fire personnel visitors.
 - 4. To protect the apparatus electrical system from any possible damage, the system bid shall not incorporate any type of electromagnetic device that requires the apparatus to be utilized as and electrical ground for the systems operation.
 - 5. Due to the harmful effects of diesel exhaust, the system must be designed and capable of capturing 100% of the exhaust gas and particulate even in the event of a complete power failure. The system shall not detach itself from the apparatus for any reason during a power failure other then normal exiting of the apparatus bay. No exception to this requirement will be allowed.

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Newport Beach Fire Station No. 1 and Library
Newport Beach, California

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6. Vehicle must be able to perform pump checks while connected to the system and capture 100% of the diesel exhaust.
7. Connection of the system to the vehicle must be made from a standing position. No exception to this requirement will be allowed.
8. Manufacturer must be I.S.O. 9001 certified

1.02 STANDARD PRODUCTS

Equipment and materials provided for the system installation shall be a standard product of manufacturer's currently engaged in the manufacturing of automatic vehicle exhaust removal systems. Where the requirement calls for a packaged exhaust system to be provided, all items shall be the product of the manufacturer.

1.03 QUALITY ASSURANCE

All workmanship, manufacturing procedures, airflow design, and materials shall be performance guaranteed. If any findings or test studies reveal improper materials, defective components or inadequate performance as outlined in the performance/technical specifications, the bidder shall remove and replace the materials in question.

1.04 EQUIPMENT WARRANTY

The bidder shall guarantee all materials, equipment and workmanship for a period of two- (2) years from the date of the final acceptance of the completed job against original defects of material and workmanship, or excessive wear or deterioration. Defects shall be made good at the bidder's expense with no cost or obligation to the Owner.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

The bidder shall be solely responsible for the delivery, storage, and handling of all products. Any equipment placed in storage shall be protected from weather, humidity, temperature variations, dirt, dust, or other contaminants.

1.06 BIDDER QUALIFICATIONS

Bids will only be accepted from companies that have an established reputation in the field of manufacturing and installing Diesel Exhaust Removal Systems. The bidder must be established in the business of Diesel Exhaust Removal Systems for a minimum of no less than eight- (8) years.

Bidder shall show proof that their system has been field tested and proven by supplying a list of not less than 100 fire department references (seven within the state the municipality is going to bid) to include a phone number and contact name.

PART 2 - PRODUCTS

2.01 DUCTWORK SYSTEM

A. Ductwork type and materials

Shall be UMC class 2 or SMACNA class 11 product conveying. It must meet or exceed criteria for construction and performance as outlined in Round Industrial Duct Construction Standards, SMACNA. Materials of construction unless otherwise specified for all ductwork and fittings shall be a minimum G-90 galvanized sheet metal in accordance with ASTM-A525 and A527. Only when specified, type 304 stainless steel in accordance with ASTM A240 shall be provided.

B. Ductwork sizing and gauges

All ductwork subject to positive or negative pressure shall be of round, laser welded, pipe construction, with the range of available sizes not to exceed 10 inches in diameter. Duct gauge shall depend on diameter and a minimum operating pressure of 8 inches water gauge. Acceptable gauge and reinforcement requirements shall be in accordance to the following. Inner duct diameter 4" - 7" dia. shall be 26-gauge standard spiral pipe and 9" - 10" dia. shall be 24-gauge standard spiral pipe.

C. Ductwork Fittings

All exhaust fittings shall be round and have a wall thickness 2 gauges (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected. Air duct branch entrances shall be factory fabricated fittings or factory fabricated duct/tap assemblies. Fittings shall be constructed so that air stream converge at angles no greater than 45 degree. All seams shall be continuous stitch welded and if necessary, internally sealed to insure airtightness. Turning elbows shall be laser welded and used for all diameters and pressures. They shall be fabricated of 24-gauge galvanized steel and constructed as two-piece with continuous welded seam construction fittings. Tapered body fittings shall be used manifold. No exceptions.

D. Ductwork Design Velocities

Shall be a minimum of 3000 feet/minute transport velocity at 275 cubic feet/per minute volume in metal ductwork at riser clamp which is the standard for design.

E. External Ductwork

Shall be sized for the exact inlet and outlet of the exhaust fan blower. If the fire station is exposed to unusual inclement weather, unusual levels of acid rain or is within 3 miles of saltwater, stainless steel shall be considered for all exterior duct work components. An exhaust rain cap shall be supplied and manufactured in accordance with EPA standard for free draft rain cap requirements. Included as an integral part of this rain cap shall be a back-draft damper to provide protection from rain and other inclement weather or air.

F. Exhaust Penetrations

To protect the fire departments best interest ductwork shall only penetrate exterior walls rather than a roof penetration. In all cases when making a wall penetration through masonry or concrete walls it shall be done by the use of a professional core-drilling machine. The core drilling shall be properly sized to reduce the diameter of the opening to the smallest possible size. Only after all possible avenues for wall penetration are exhausted, shall the roof penetration be accepted. The original roofing contractor shall perform the work if possible, to insure any warranties on the existing roof are not voided. If the original roofing contractor cannot be notified a licensed roofing contractor shall be used.

2.02 VEHICLE EXHAUST REMOVAL SYSTEM EQUIPMENT

A. Sliding Track

The sliding track shall be a one-piece continuous extruded aluminum track in a minimum length of 20 feet. The construction profile shall be of a boxloc type pro-file, which shall adhere to the following dimensions. Track height 3 1/8", width 1 1/2", thickness 1/8". The track material shall be aircraft aluminum alloy type AA-06063. The aluminum track shall be an extruded design that shall incorporate three separate and functioning channels. The three channels shall be for the following, mounting channel, trolley channel and the boxloc channel. Each of these sections performs a specific function to make the system work effectively. The mounting compartment shall be designed to accept the slider bars (which shall be provided with factory supplied vertical legs and riser clamp duct connection) and allow positioning along the full length of the slotted track mounting channel. The mounting channel shall also accommodate the com-pressed airlines for the purposes of safe storage and appearance. The trolley channel shall allow the trolley/balancer/hose assembly to glide to the door threshold in a safe and effective manner. The boxloc channel shall allow the whole track to remain rigid as it hangs from factory supplied leg supports and also shall provide an area to attach bolts for splicing additional tracks together for systems over 20 feet long. The overall extruded track lengths shall be 20-foot standard and weight no more then 35 lbs. The track system shall be equipped with end stops that limit travel of flex hose as the vehicle exits the building. The end stop shall be fabricated of zinc plated steel in a U shape form, with a rubber end stop on the impact end. It shall be attached by using a 1/4" molded locking bolt. The end stop shall be secured to the track with no less than (2) 1/4" bolts and locking nuts located on the underside of the track. For security, a 1/4" bolt shall be drilled through the ends of each track system to ensure that the trolley/balancer assembly(s) roll no further then the end of the track system.

B. Double Track Joiner Plate

Should the exhaust removal system require a double track type system due to the length of the apparatus bays, the tracks shall be attached in the following manner. The joiner plate shall be constructed from a minimum of 1/4" thick zinc-plated material and be designed to connect two parallel tracks to make a double track system to accommodate an apparatus bay over 40 feet in length. The joiner plate shall be 10" x 8" flat zinc-plated steel and designed to attach the two tracks to a single factory supplied support leg. The steel plate shall have (6) 3/8" holes drilled 6 7/8" apart to accommodate the slider bar provided with factory support legs. The joiner plate shall have two slider bars attached to the plate and shall be located on the outside edges of plate, these slider bars shall fit into the boxloc track mounting channel for a simple and secure attachment of the plate to boxloc track. The center portion of the joiner plate shall provide attachment for the factory supplied support leg.

C. Track Splicing Assembly

The track splicing assembly shall be fabricated for the sole function of connecting two extruded aluminum boxloc sliding tracks end-to-end. Track splice shall be manufactured of galvanized steel in two parts and utilized as a clamping device. This clamp shall accurately secure both tracks together in a fashion, which shall eliminate any possibility of obstructing the trolley assembly as it passes through this connection point of track system. Connecting length of splice shall be a minimum of 15 3/4" long and fabricated of 14-gauge material. Four 1/4" bolts with lock nuts shall pass directly through internal partition of boxloc track. The splicing sleeve shall fit externally around the outside dimension of extruded aluminum track profile.

D. Riser Clamp Assembly

The riser clamp shall be fabricated as a one-piece welded assembly and manufactured to create the transfer of the hard-spiral pipe joined at the top and flexible duct connection at the bottom. The riser clamp shall be pre-drilled to mount an air regulator assembly for the pneumatic nozzle and to accept airlines that pass through airtight seals mounted to riser pipe. A slider bar and associated hardware shall be provided with riser clamp assembly. Sizes of the riser clamp will range from 3" - 6" diameter to match the output velocity of the vehicles that will park in that station.

E. Accutrack Trolley / Balancer Assembly

The trolley assembly shall be manufactured as a two-piece galvanized steel assembly including bumper stops at each end. Fixed to the side of the trolley are solid steel pins, which shall be for load carrying bearings that are sealed and permanently lubricated. The Load carrying bearings shall travel internally in track trolley channel. Two additional permanently lubricated trolley wheels shall be provided on bottom side of the track to reduce wobble of trolley as it conveys the hose assembly to the door threshold. A release plate shall be attached to the chassis of the trolley to smoothly energize the uncoupling release valve when the trolley-balancer assembly approaches the door threshold. The system balancer assembly shall be a self-adjusting weight spring tension balancer with a lifting capacity of no less than 31 Lb. The balancer shall have a minimum diameter stainless steel cable of .080 and a safety link connection. The system supplier shall manufacture the balancer and trolley for the sole purpose of conveying the flexible hose to the door threshold for automatic release of the system. Only a stainless-steel balancer cable will be accepted. No exceptions.

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SECTION 26 05 19

LOW-VOLTAGE CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Aluminum building wire rated 600 V or less.
3. Metal-clad cable, Type MC, rated 600 V or less.
4. Fire-alarm wire and cable.
5. Connectors, splices, and terminations rated 600 V and less.

1.02 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.01 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. 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. Belden Inc.
 2. Southwire Company.
- C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 2. RoHS compliant.
 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
1. Type THHN and Type THWN-2: Comply with UL 83.
 2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

3. Type XHHW-2: Comply with UL 44.

2.02 ALUMINUM BUILDING WIRE

2.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 1. Product Data: For each conductor and cable indicating lead content.
 2. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 3.
 4. Product Data: For solvents and adhesives, indicating VOC content.
 5. Laboratory Test Reports: For solvents and adhesives, indicating compliance with requirements for low-emitting materials.
 - 6.
- C. Product Schedule: Indicate type, use, location, and termination locations.
- D. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- E. 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. Belden Inc.
 2. Southwire Company.
- F. Standards:
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 2. RoHS compliant.
 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- G. Conductors: Aluminum, complying with ASTM B800 and ASTM B801.
- H. Conductor Insulation:
 1. Type THHN] and Type THWN-2: Comply with UL 83.
 2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
 3. Type XHHW-2: Comply with UL 44.

2.04 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. 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. Belden Inc.
 - 2. Southwire Company.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Comply with UL 1569.
 - 3. RoHS compliant.
 - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
 - 1. Single circuit.
 - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- F. Ground Conductor: Bare.
- G. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
 - 2. Type XHHW-2: Comply with UL 44.
- H. Armor: Steel, interlocked.
- I. Jacket: PVC applied over armor.

2.05 FIRE-ALARM WIRE AND CABLE

- 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. Comtran Corporation.
 - 2. nVent (PYROTENAX).
 - 3. Rockbestos-Suprenant Cable Corp.
- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.
- D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
 1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
 3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NRTL listed for fire-alarm and cable tray installation, plenum rated.

2.06 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. 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. 3M Electrical Products.
 2. ABB, Electrification Products Division.
 3. AFC Cable Systems; Atkore International.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 1. Material: Copper.
 2. Type: One hole with standard barrels.
 3. Termination: Compression.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
 1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
 1. Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway Metal-clad cable, Type MC.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway Metal-clad cable, Type MC.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.04 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method:
 - 1. Install plenum cable in environmental airspaces, including plenum ceilings.

2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system shall be installed in a dedicated pathway system.
 - a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.
 3. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is permitted.
 4. Signaling Line Circuits: Power-limited fire-alarm cables shall not be installed in the same cable or pathway as signaling line circuits.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.
- F. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.

3.05 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors].
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.06 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.07 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.08 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078400 "Penetration Firestopping."

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Foundation steel electrodes.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:

1.03 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
 - 1. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
 - a. Test wells.
 - b. Ground rods.
 - c. Ground rings.
 - d. Grounding arrangements and connections for separately derived systems.
 - 2. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, grounding connections for separately derived systems based on NETA MTS.

- a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
- b. Include recommended testing intervals.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.02 MANUFACTURERS

2.03 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B3.
 - 2. Stranded Conductors: ASTM B8.
 - 3. Tinned Conductors: ASTM B33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.04 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- K. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- L. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- M. Straps: Solid copper, copper lugs. Rated for 600 A.
- N. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one-piece clamp.
- O. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- P. Water Pipe Clamps:
 - 1. Mechanical type, two pieces with zinc-plated bolts.
 - a. Material: Tin-plated aluminum.
 - b. Listed for direct burial.
 - 2. U-bolt type with malleable-iron clamp and copper ground connector.

2.05 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.
- B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 30 inches below grade.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.02 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.04 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.05 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 - 9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.06 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.07 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

- a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
 - 5. Substations and Pad-Mounted Equipment: 5 ohms.
 - 6. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

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SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.03 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

- B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
- C. Welding certificates.

1.04 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
 - 2. Component Importance Factor: 1.5.
 - 3. .
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D635.

2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
 - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 2. Material for Channel, Fittings, and Accessories: Galvanized steel Stainless steel, Type 304 Stainless steel, Type 316.
 - 3. Channel Width: Selected for applicable load criteria.
 - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.03 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA 101
 - 3. NECA 105.
- B. Comply with requirements in Section 078400 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION

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SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.03 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. ARC: Comply with ANSI C80.5 and UL 6A.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - a. Comply with NEMA RN 1.
 - b. Coating Thickness: 0.040 inch, minimum.
6. EMT: Comply with ANSI C80.3 and UL 797.
7. FMC: Comply with UL 1; zinc-coated steel or aluminum.
8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
4. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
5. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
6. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1. ENT: Comply with NEMA TC 13 and UL 1653.
2. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. LFNC: Comply with UL 1660.

- C. Nonmetallic Fittings:
 - 1. Fittings, General: Listed and labeled for type of conduit, location, and use.
 - 2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
 - 3. Fittings for LFNC: Comply with UL 514B.
 - 4. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R Type 4 by application unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.04 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- C. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- D. Solvents and Adhesives: As recommended by conduit manufacturer.

2.05 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Metal Floor Boxes:
 - 1. Material: sheet metal.
 - 2. Type: Fully adjustable.

3. Shape: Rectangular.
 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- H. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- M. Gangable boxes are allowed.
- N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1. Type 3R. Type 4 [by application with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Plastic.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- O. Cabinets:
1. NEMA 250, Type 1, Type 3R by application galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.
 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.06 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Oldcastle Infrastructure Inc.; CRH Americas.
 - b. Quazite; Hubbell Incorporated, Power Systems.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC."
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of hot-dip galvanized-steel diamond plate.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Oldcastle Infrastructure Inc.; CRH Americas.
 - b. Quazite; Hubbell Incorporated, Power Systems.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC."
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried or concrete encased.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 - e.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.02 INSTALLATION

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Do not fasten conduits onto the bottom side of a metal deck roof.
- E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- F. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches of enclosures to which attached.
- L. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from ENT to RNC, Type EPC-40-PVC, before rising above floor.
- M. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Conduit extending from interior to exterior of building.
 - 4. Conduit extending into pressurized duct and equipment.
 - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - 6. Where otherwise required by NFPA 70.
- V. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - e. .

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- AA. Locate boxes so that cover or plate will not span different building finishes.
- BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- DD. Set metal floor boxes level and flush with finished floor surface.
- EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
 2. Install backfill as specified in Section 312000 "Earth Moving."
 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."

4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.06 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078400 "Penetration Firestopping."

3.07 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

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SECTION 26 05 43

UNDERGROUND DUCT AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EPEC raceways and fittings.
2. Type ERMCS raceways, elbows, couplings, and nipples.
3. Type ERMCS raceways, elbows, couplings, and nipples.
4. Type IMC raceways.
5. Type PVC raceways and fittings.
6. Type RTRC-BG raceways and fittings.
7. Fittings for conduit, tubing, and cable.
8. Electrically conductive corrosion-resistant compounds for threaded conduit.
9. Solvent cements.
10. Duct accessories.
11. Handholes and boxes for exterior underground wiring.
12. Manholes for exterior underground wiring.
13. Utility structure accessories.
14. Duct sealing.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" specifies seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
3. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).
4. Section 260553 "Identification for Electrical Systems" specifies underground-line warning tape and concrete cable routing markers (warning planks).

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Preinstallation Coordination Meeting(s): For underground ducts and raceways. Conduct meeting(s) as videoconference or at Project site before.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For concrete and steel used in precast concrete manholes and handholes, also include product certificates as required by ASTM C858.

B. Shop Drawings:

1. Electric Utility Duct Banks and Structures:
 - a. Include plans, elevations, sections, and details, including attachments to other Work.
 - b. Indicate locations of private property boundaries and utility easements.
 - c. Include information required for approval by electric utility and for obtaining public space utility work permits.
2. Precast or Factory-Fabricated Concrete Structures:
 - a. Include plans, elevations, sections, and details, including attachments to other Work.
 - b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
 - c. Include reinforcement details.
 - d. Include frame and cover design and manhole chimneys.
 - e. Include ladder details.
 - f. Include grounding details.
 - g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, sumps, and other accessories.
 - h. Include joint details.
3. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
 - a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
 - c. Include cover design.
 - d. Include grounding details.
 - e. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and other accessories.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:

1. For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C858.

B. Manufacturers' Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. Source Quality-Control Submittals:

1. Source quality-control reports.

1.5 REGULATORY AGENCY APPROVALS

- A. Shop Drawing submittals for electric utility duct banks and structures must be signed and sealed by qualified electrical professional engineer responsible for their preparation.
- B. Submit Shop Drawings for electric utility duct banks and structures for action by Architect prior to submitting for approval by electric utility.

PART 2 - PRODUCTS

2.1 TYPE EPEC RACEWAYS AND FITTINGS

- A. Performance Criteria:
 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 2. General Characteristics: UL 651A and UL CCN EAZX.
- B. Schedule 40 Electrical HDPE Underground Conduit (EPEC-40):
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Blue Diamond Industries, LLC.
 - b. JM Eagle.
 - c. Petroflex North America.
 2. Dimensional Specifications: Schedule 40.
 3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
- C. Schedule 80 Electrical HDPE Underground Conduit (EPEC-80):
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Blue Diamond Industries, LLC.
 - b. Petroflex North America.
 - c. Southwire Company, LLC.
 2. Dimensional Specifications: Schedule 80.
 3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.2 TYPE PVC RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 651 and UL CCN DZYR.

B. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. [ABB Electrification Installations Products.](#)
 - b. [Calconduit; Atkore International.](#)
 - c. [JM Eagle.](#)
2. Dimensional Specifications: Schedule 40.
3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Markings: For use with maximum 90 deg C wire.

C. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. [ABB Electrification Installations Products.](#)
 - b. [Calconduit; Atkore International.](#)
 - c. [JM Eagle.](#)
2. Dimensional Specifications: Schedule 80.
3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Markings: For use with maximum 90 deg C wire.

2.3 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. Metallic Fittings for Type ERM, Type IMC, Type PVC, Type EPEC, and Type RTRC Raceways:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. [ABB Electrification Installations Products.](#)

- b. [Appleton; Emerson Electric Co., Automation Solutions.](#)
 - c. [Crouse-Hinds; brand of Eaton, Electrical Sector.](#)
- 2. General Characteristics: UL 514B and UL CCN DWTT.
- 3. Options:
 - a. Steel Coupling Method: Raintight compression coupling with distinctive color gland nut.
 - b. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
 - c. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

2.4 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics: UL Subject 2419 and UL CCN FOIZ.

B. [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. [ABB Electrification Installations Products.](#)

2.5 SOLVENT CEMENTS

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.

2.6 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

- 1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. [ABB Electrification Installations Products.](#)
 - b. [Allied Tube & Conduit; Atkore International.](#)
 - c. [Cantex Inc.](#)

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 2. General Characteristics:
 - a. ASTM C858 for design and manufacturing processes.
 - b. SCTE 77.
- B. Source Quality Control:
1. Precast Concrete Utility Structures: Test and inspect in accordance with ASTM C1037.
 2. Polymer Concrete and Nonconcrete Handhole and Pull-Box Prototypes: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests must be for specified tier ratings of products supplied. Testing machine pressure gages must have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.
 - a. Tests of materials must be performed by independent testing agency.
- C. Precast Concrete Handholes and Boxes:
1. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover must form top of enclosure and must have load rating consistent with that of handhole or box.
 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. [Elmhurst-Chicago Stone Co.](#)
 - b. [Oldcastle Infrastructure Inc.; CRH Americas.](#)
 - c. [Rinker Group, Ltd.](#)
 3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
 4. Frame and Cover:
 - a. Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 - b. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
 - c. Cover Legend: Molded lettering, "ELECTRIC".
 5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - a. Extension must provide increased depth of 12 inch.
 - b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
 6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.
 7. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional 12 inch vertically and horizontally to accommodate alignment variations.
 8. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

9. Handholes 12 inch wide by 24 inch long and larger must have inserts for cable racks and pulling-in irons installed before concrete is poured.

D. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover:

1. Description: Molded of sand, concrete, and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or combination.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Armorcast Products Company; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - b. MacLean Highline.
 - c. NewBasis.
3. Configuration: Units must be designed for flush burial and have closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and installed location.
 - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
 - b. Cover Legend: Molded lettering, "ELECTRIC".
5. Conduit Entrance Provisions: Conduit-terminating fittings must mate with entering ducts for secure, fixed installation in enclosure wall.
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings must mate with entering duct for secure, fixed installation in enclosure wall.
8. Handholes 12 inch wide by 24 inch long and larger must have factory-installed inserts for cable racks and pulling-in irons.
9. Options:
 - a. Color: Gray.

E. High-Density Polyethylene (HDPE) Boxes:

1. Description: Injection molded of HDPE or copolymer-polypropylene. Cover must be made of polymer concrete.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Nordic Fiberglass, Inc.
 - b. Oldcastle Infrastructure Inc.; CRH Americas.
 - c. PenCell Plastics; brand of Hubbell Utility Solutions; Hubbell Incorporated.
3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

- a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
 - b. Cover Legend: Molded lettering, "ELECTRIC".
- 5. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- 6. Duct Entrance Provisions: Duct-terminating fittings must be installed perpendicular to box wall and mate with entering duct for secure, fixed installation in enclosure wall without putting stress on box wall or fitting.
- 7. Options:
 - a. Color: Green.

2.8 MANHOLES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics:
 - a. ASTM C858 for design and manufacturing processes.
 - b. SCTE 77.

B. Precast Concrete Manholes:

- 1. Description: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.
- 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carder Concrete Products.
 - b. Elmhurst-Chicago Stone Co.
 - c. Oldcastle Infrastructure Inc.; CRH Americas.
- 3. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional 12 inch vertically and horizontally to accommodate alignment variations.
- 4. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
- 5. Ground Rod Sleeve: Provide 3 inch PVC sleeve in manhole floors 2 inch from wall adjacent to, but not underneath, duct entering structure.
- 6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.
- 7. Source Quality Control: Test and inspect in accordance with ASTM C1037.

C. Cast-in-Place Concrete Manholes:

- 1. Description: Underground utility structures, constructed in place, complete with accessories, hardware, and features. Include concrete knockout panels for duct entrance and sleeve for ground rod.

2. Additional Criteria: Comply with Section 033000 "Cast-in-Place Concrete."

2.9 UTILITY STRUCTURE ACCESSORIES

- A. Description: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application, and complying with the following local utility company requirements:
- B. 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. BILCO Company (The).
 2. Campbell Foundry Company.
 3. Carder Concrete Products.
- C. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.
 1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A48/A48M, Class 30B with milled cover-to-frame bearing surfaces; diameter, 26 inch.
 - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
 - b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
 2. Cover Legend: Cast in; selected to suit system.
 - a. Legend: "ELECTRIC."
 3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
 - a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C270, Type M, except for quantities less than 2.0 cu. ft where packaged mix complying with ASTM C387/C387M, Type M, may be used.
 - b. Seal joints watertight using preformed plastic or rubber complying with ASTM C990. Install sealing material in accordance with sealant manufacturers' published instructions.
- D. Manhole Sump Frame and Grate: ASTM A48/A48M, Class 30B, gray cast iron.
- E. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2 inch diameter eye, and 1-by-4 inch bolt.
 1. Working Load Embedded in 6 inch, 4000 psi Concrete: 13,000 lbf minimum tension.
- F. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4 inch diameter eye, rated 2500 lbf minimum tension.
- G. Pulling-in and Lifting Irons in Concrete Floors: 7/8 inch diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; fastened to reinforcing rod; and with exposed triangular opening.

1. Ultimate Yield Strength: 40,000 lbf shear and 60,000 lbf tension.
- H. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2 inch ID by 2-3/4 inch deep, flared to 1-1/4 inch minimum at base.
1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.
- I. Ground Rod Sleeve: 3 inch PVC sleeve in manhole floors 2 inch from wall adjacent to, but not underneath, ducts routed from facility.
- J. Steel Cable Rack Assembly: Hot-rolled galvanized, except insulators.
1. Stanchions: T-section or channel with provisions to connect to other sections or channels to form continuous unit; 1-1/2 inch in width by nominal 24 inch long; punched with 14 hook holes on 1-1/2 inch centers for cable-arm attachment.
 2. Arms: 1-1/2 inch wide, lengths ranging from 3 inch with 450 lb minimum capacity to 18 inch with 250 lb minimum capacity. Arms must have slots along full length for cable ties and be arranged for secure mounting in horizontal position at vertical locations on stanchions.
 3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
- K. Nonmetallic Cable Rack Assembly: Components fabricated from nonconductive, fiberglass-reinforced polymer.
1. Stanchions: Nominal 36 inch high by 4 inch wide, with provisions to connect to other sections to form continuous unit, with minimum of nine holes for arm attachment.
 2. Arms: Arranged for secure, drop-in attachment in horizontal position at locations on cable stanchions, and capable of being locked in position. Arms must be available in lengths ranging from 3 inch with 450 lb minimum capacity to 20 inch with 250 lb minimum capacity. Top of arm must be nominally 4 inch wide, and arm must have slots along full length for cable ties.
- L. Fixed Manhole Ladders: Arranged for attachment to roof or wall of manhole. Ladder and mounting brackets and braces must be fabricated from nonconductive, structural-grade, fiberglass-reinforced resin.
- M. Portable Manhole Ladders: UL-listed, heavy-duty wood specifically designed for portable use for access to electrical manholes. Length must be not less than distance from deepest manhole floor to grade plus 36 inch. Two ladder(s) are required.
- N. Cover Hooks: Heavy duty, designed for lifts 60 lbf and greater. Two ladders(s) are required.
- 2.10 DUCT SEALING
- 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. [ABB Electrification Installations Products](#).
 2. American Polywater Corporation.
 3. [CommScope, Inc.](#)

- B. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Compound must be capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals. Duct sealing compound must be removable without damaging ducts or cables.
- C. Inflatable Duct-Sealing System: Wraparound inflatable bladder that seals ducts that are empty or containing conductors against air and water infiltration. System is suitable for use in steel, plastic, or concrete ducts and penetrations.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Architect if there is conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

3.2 SELECTION OF UNDERGROUND DUCTS

- A. Duct for Electrical Feeders: PVC-40, concrete encased unless otherwise indicated.
- B. Duct for Electrical Branch Circuits: PVC-40, direct buried unless otherwise indicated.
- C. Bored Underground Duct: EPEC-40 unless otherwise indicated.
- D. Underground Ducts Crossing Paved Paths ,Walks and Driveways: PVC-40 encased in reinforced concrete.
- E. Underground Ducts Crossing Roadways: PVC-40, encased in reinforced concrete.
- F. Stub-ups: Concrete encased, IMC.

3.3 SELECTION OF UNDERGROUND ENCLOSURES

- A. Handholes and Boxes:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete, AASHTO HB 17, H-10 structural load rating.
 - 2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.

3. Units in Sidewalk and Similar Applications with Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested in accordance with SCTE 77 with 3000 lbf vertical loading.
5. Cover design load must not exceed load rating of handhole or box.

B. Manholes: Precast concrete.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Restore area immediately after backfilling is completed.
- C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."
- E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures in accordance with "Cutting and Patching" Article in Section 017300 "Execution."

3.5 INSTALLATION OF DUCTS AND DUCT BANKS

A. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Where indicated on Drawings, install duct, spacers, and accessories into duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
2. Steel raceway, bends, and fittings in single duct run or duct bank must be of same type.
3. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.
4. Expansion and Deflection Fittings: Install expansion and deflection fitting in each duct in area of disturbed earth adjacent to manhole or handhole.
5. Install expansion fitting near center of straight line duct with calculated expansion of more than 3/4 inch.
6. Curves and Bends:
 - a. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of 48 inch, both horizontally and vertically, at other locations unless otherwise indicated.

- b. Field bending must be in accordance with NFPA 70 minimum radii requirements, except bends over 45 degrees must be made with minimum radius of 48 inch. Use only equipment specifically designed for material and size involved. Use PVC heating bender for bending PVC conduit.
 - c. Duct must have maximum of 180 degrees of bends between pull points.
- 7. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete for minimum of 12 inch on each side of coupling.
 - a. Install insulated grounding bushings on steel raceway terminations that are less than 12 inch below grade or floor level and do not terminate in hubs.
- 8. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing duct will not be subject to environmental temperatures above 104 deg F. Where environmental temperatures are calculated to rise above 104 deg F, and anywhere duct crosses above underground steam line, install insulation blankets listed for direct burial to isolate duct bank from steam line to maintain maximum environmental temperature of 104 deg F.
- 9. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inch o.c. for 5 inch duct, and vary proportionately for other duct sizes.
 - a. Begin change from regular spacing to end-bell spacing 10 ft from end bell, without reducing duct slope and without forming trap in line.
 - b. Grout end bells into structure walls from both sides to provide watertight entrances.
- 10. Duct Terminators for Entrances to Cast-in-Place Manholes and Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inch o.c. for 4 inch duct, and vary proportionately for other duct sizes.
 - a. Begin change from regular spacing to terminator spacing 10 ft from terminator, without reducing duct line slope and without forming trap in line.
- 11. Building Wall Penetrations: Make transition from underground duct to steel raceway at least 10 ft outside building wall, without reducing duct line slope away from building and without forming trap in line. Use fittings manufactured for transition to steel raceway type installed. Install steel raceway penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- 12. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15 psig hydrostatic pressure.
- 13. Pulling Cord: Install 200 lbf test nylon cord in empty ducts.
- 14. Concrete-Encased Ducts and Duct Bank:
 - a. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes 6 inch or less in nominal diameter.
 - b. Width: Excavate trench 3 inch wider than duct on each side.
 - c. Depth: Install so top of duct envelope is at least 24 inch below finished grade in areas not subject to deliberate traffic, and at least 30 inch below finished grade in deliberate traffic paths for vehicles unless otherwise indicated. Install so top of duct envelope is below local frost line.

- d. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
- e. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
- f. Minimum Space between Ducts: 3 inch between edge of duct and exterior envelope wall, 2 inch between ducts for like services, and 4 inch between power and communications ducts.
- g. Stub-ups to Outdoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of equipment base.
 - 1) Stub-ups must terminate in coupling installed flush with finished floor and minimum 3 inch from conduit side to edge of slab.
- h. Stub-ups to Indoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of wall. Install insulated grounding bushings on terminations at equipment.
 - 1) Stub-ups must terminate in coupling installed flush with finished floor and no less than 3 inch from conduit side to edge of slab.
- i. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
- j. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
- k. Concrete Cover: Install minimum of 3 inch of concrete cover between edge of duct to exterior envelope wall, 2 inch between duct of like services, and 4 inch between power and communications ducts.
- l. Place minimum 6 inch of engineered fill above concrete encasement of duct.
- m. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.

15. Direct-Buried Duct and Duct Bank:

- a. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inch in nominal diameter.
- b. Width: Excavate trench 3 inch wider than duct on each side.
- c. Depth: Install top of duct at least 36 inch below finished grade unless otherwise indicated.
- d. Set elevation of top of duct bank below frost line.
- e. Place minimum 3 inch of sand as bed for duct. Place sand to minimum of 6 inch above top level of duct.
- f. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.

- g. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - h. Install duct with minimum of 3 inch between ducts for like services and 6 inch between power and communications duct.
 - i. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inch over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.
- 16. Underground-Line Warning Tape: Bury nonconducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inch above concrete-encased duct and duct banks and approximately 12 inch below grade. Align tape parallel to and within 3 inch of centerline of duct bank. Provide additional warning tape for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional tapes 12 inch apart, horizontally across width of ducts.
 - 17. Ground ducts and duct banks in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Reference Standards:

- 1. Precast Concrete Handholes: Comply with ASTM C891 unless otherwise indicated.
- 2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Cast-in-Place Manholes:

- a. Finish interior surfaces with smooth-troweled finish.
- b. Knockouts for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inch thick, arranged as indicated.
- c. Comply with requirements in Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.

2. Precast Concrete Handholes and Manholes:

- a. Install units level and plumb and with orientation and depth coordinated with connecting duct to minimize bends and deflections required for proper entrances.
- b. Unless otherwise indicated, support units on level bed of crushed stone or gravel graded from 1 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- c. Field-cut openings for conduits in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be

cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3. Elevations:
 - a. Manhole Roof: Install with rooftop at least 15 inch below finished grade.
 - b. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
 - c. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
 - d. Where indicated, cast handhole cover frame integrally with handhole structure.
4. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.
5. Manhole Access: Circular opening in manhole roof; sized to match cover size.
 - a. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
 - b. Install chimney, constructed of precast concrete collars and rings, and cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight joints and waterproof grouting for frame and chimney.
6. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Waterproofing materials and installation are specified in. After duct has been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.
7. Dampproofing: Apply dampproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Section 071113 "Bituminous Dampproofing." After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.
8. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.
9. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.
10. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inch for manholes and 2 inch for handholes, for anchor bolts installed in field. Use minimum of two anchors for each cable stanchion.
11. Ground manholes, handholes, and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Reference Standards:

1. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.

- Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
2. Unless otherwise indicated, support units on level bed of crushed stone or gravel, graded from 1/2 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
 3. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
 4. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
 5. Field cut openings for duct in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
 6. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour concrete ring encircling, and in contact with enclosure entry, and with top surface screeded to top of box cover frame. Bottom of ring must rest on compacted earth.
 - a. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with troweled finish.
 - b. Dimensions: 10 inch wide by 12 inch deep.
 7. Ground handholes and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Nonconforming Work:

1. Underground ducts, raceways, and structures will be considered defective if they do not pass tests and inspections.
2. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Assemble and submit test and inspection reports.

D. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

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SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Round sleeves.
 - 2. Rectangular sleeves.
 - 3. Sleeve seal systems.
 - 4. Grout.
 - 5. Pourable sealants.
 - 6. Foam sealants.

1.03 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.01 ROUND SLEEVES

- A. Wall Sleeves, Steel:
 - 1. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral water stop.
- B. Pipe Sleeves, PVC:
 - 1. Description: ASTM D1785, Schedule 40.
- C. Sheet Metal Sleeves, Galvanized Steel, Round:
 - 1. Description: Galvanized-steel sheet; thickness not less than 0.0239-inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.02 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Description:

- a. Material: Galvanized sheet steel.
- b. Minimum Metal Thickness:
 - 1) For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness must be 0.052 inch.
 - 2) For sleeve cross-section rectangle perimeter not less than 50 inches or with one or more sides larger than 16 inches, thickness must be 0.138 inch.

2.03 SLEEVE SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel Fiber-reinforced plastic.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.04 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.05 POURABLE SEALANTS

A. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.06 FOAM SEALANTS

A. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.01 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless sleeve seal system is to be installed or seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- C. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for wall assemblies.
- D. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- F. Underground, Exterior-Wall and Floor Penetrations:
 - 1. Install steel pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

3.02 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.
- B. Install conduits and cable with no crossings within the sleeve.
- C. Fill opening around conduits and cables with expanding foam without leaving voids.
- D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.03 INSTALLATION OF SLEEVE SEAL SYSTEMS

- A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 26 05 48

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Restraints - rigid type.
3. Restraints - cable type.
4. Restraint accessories.
5. Post-Installed concrete anchors.
6. Concrete inserts.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.02 ACTION SUBMITTALS

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

1. Include rated load capacity for each seismic-restraint device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
3. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by ICC-ES product listing and UL product listing or an agency acceptable to authorities having jurisdiction.
4. Annotate to indicate application of each product submitted and compliance with requirements.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittal for Each Seismic-Restraint Device:

1. For each seismic-restraint device, including restraint - rigid and cable type, restraint accessory, and concrete anchor and insert that is required by this Section or is indicated on Drawings, submit the following:

- a. Seismic Restraints: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
- b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
- c. Seismic Design Calculations: Submit all input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.
- d. Qualified Professional Engineer: All designated design submittals for seismic calculations are to be signed and sealed by the qualified professional engineer responsible for their preparation.

2. Seismic-Restraint Detail Drawings:

- a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
- b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

1.03 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Welding certificates.
- C. Field quality-control reports.
- D. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in ASCE/SEI 7-05, Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.
 - 1. Provide equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7, including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction or experience data as permitted by ASCE/SEI 7-05.
 - 2. Provide equipment manufacturer's written certification that components with hazardous contents maintain containment following the design earthquake by methods required in ASCE/SEI 7-05.
 - 3. Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by a licensed professional engineer.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, be and NRTL as defined by OSHA in 29 CFR 1910.7, and be acceptable to authorities having jurisdiction.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing and UL product listing or an agency acceptable to authorities having jurisdiction.
- D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design seismic control system.
 - 1. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7-05.
- B. Seismic Design Calculations:
 - 1. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in ASCE/SEI 7-05. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.
 - a. Data indicated below to be determined by Delegated Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
 - b. Building Occupancy Category: as determined by civil and structural engineer.
 - c. Building Risk Category: as determined by civil and structural engineer.
 - d. Building Site Classification: as determined by civil and structural engineer.

2.02 RESTRAINTS - RIGID TYPE

- A. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.03 RESTRAINTS - CABLE TYPE

- A. Seismic- and Wind-Load-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket, or mechanical (Flemish eye) loop.
- B. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.04 RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.05 POST-INSTALLED CONCRETE ANCHORS

- A. Mechanical Anchor Bolts:
 - 1. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.
- B. Provide post-installed concrete anchors that have been prequalified for use in seismic and wind-load applications. Post-installed concrete anchors must comply with all requirements of ASCE/SEI 7-05, Ch. 13.
 - 1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 - 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- C. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp that is not vibration isolated.
 - 1. Undercut expansion anchors are permitted.

2.06 CONCRETE INSERTS

- A. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC446 testing.
- B. Comply with MSS SP-58.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and equipment to receive seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static and seismic loads within specified loading limits.

3.03 INSTALLATION OF SEISMIC-RESTRAINT DEVICES

- A. Provide seismic restraint devices for systems and equipment where indicated in Equipment Schedules or Electrical Seismic and Wind-Load Controls Schedule, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.
 - 1. Install all equipment and devices to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7-05.
- B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- C. Installation of seismic restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.

D. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Raceway, Cable, Wireway, Cable Tray, and Busway Support and Hanger Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction that provides required submittals for component.
3. Comply with requirements in NFPA 70 and ASCE/SEI 7-05.

F. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for component.

G. Install cables so they do not bend across edges of adjacent equipment or building structure.

H. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

J. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Perform tests and inspections.
 - 2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
 - 4. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 5. Test no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
 - 6. Test to 90 percent of rated proof load of device.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Seismic controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION

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SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for raceways, conductors, warning labels and signs.
 - 2. Labels.
 - 3. Bands and tubes.
 - 4. Tapes and stencils.
 - 5. Tags.
 - 6. Signs.
 - 7. Cable ties.
 - 8. Paint for identification.
 - 9. Fasteners for labels and signs.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

- E. Comply with NFPA 70E.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - 1. Color shall be factory applied.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Colors for 240-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - 4. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - 5. Color for Neutral: White or gray.
 - 6. Color for Equipment Grounds: Bare copper.
 - 7. Colors for Isolated Grounds: Green two or more yellow stripes.
- C. Warning Label Colors:
 - 1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field.

2.03 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Panduit Corp.
 - c. Seton Identification Products; a Brady Corporation company.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Panduit Corp.
 - c. Seton Identification Products; a Brady Corporation company.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements,:
 - a. Brady Corporation.
 - b. Panduit Corp.
 - c. Seton Identification Products; a Brady Corporation company.
2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.

D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.

- b. Panduit Corp.
 - c. Seton Identification Products; a Brady Corporation company.
- 2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches for raceway and conductors.
 - b. 3-1/2 by 5 inches for equipment.
 - c. As required by authorities having jurisdiction.

2.04 BANDS AND TUBES

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameter and that stay in place by gripping action.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Panduit Corp.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Panduit Corp.

2.05 SIGNS

- A. Baked-Enamel Signs:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlton Industries, LP.
 - b. emedco.
 - c. Marking Services, Inc.
 - 2. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 3. 1/4-inch grommets in corners for mounting.
 - 4. Nominal Size: 7 by 10 inches.
- B. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. emedco.
 - c. Marking Services, Inc.
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. in., 1/8 inch thick.
 - c. Engraved legend with black letters on white face.
 - d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.06 CABLE TIES

- 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. Hellermann Tyton.
 2. Marking Services, Inc.
 3. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- I. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

- L. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- M. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "EMERGENCY POWER."
 - 2. "POWER."
 - 3. "UPS."
 - 4. .
- N. Vinyl Wraparound Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- O. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- P. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- Q. Self-Adhesive Labels:
 - 1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
- R. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- S. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- T. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- U. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
 - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- V. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- W. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

2. Install underground-line warning tape for direct-buried cables and cables in raceways.

X. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

Y. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

Z. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

AA. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.02 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
 1. "EMERGENCY POWER."
 2. "POWER."
 3. "UPS."
- D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use with the conductor or cable designation, origin, and destination.

- E. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.
- F. Auxiliary Electrical Systems Conductor Identification: Marker tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- G. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- H. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- I. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels or Baked-enamel warning signs or Metal-backed, butyrate warning signs.
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
- K. Arc Flash Warning Labeling: Self-adhesive labels.
- L. Operating Instruction Signs: Self-adhesive labels or Baked-enamel warning signs Metal-backed, butyrate warning signs or Laminated acrylic or melamine plastic signs.
- M. Emergency Operating Instruction Signs: Self-adhesive labels or Baked-enamel warning signs or Metal-backed, butyrate warning signs Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.
- N. Equipment Identification Labels:
 - 1. Indoor Equipment: Self-adhesive label or Baked-enamel signs Metal-backed butyrate signs or Laminated acrylic or melamine plastic sign.
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION

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SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Electronic time switches.
2. Electromechanical dial-time switches.
3. Outdoor photoelectric switches, solid state, flexible mounting.
4. Outdoor photoelectric switches, low voltage.
5. Indoor occupancy and vacancy sensors.
6. Switchbox-mounted occupancy sensors.
7. Digital timer light switch.
8. Outdoor motion sensors.
9. Lighting contactors.
10. Conductors and cables.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.
2. All lighting controls shall be Cooper Wavelinx wireless, networked lighting control system or approved equivalent.

1.02 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings:

1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

1.03 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's warranties.

1.04 WARRANTY

- A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.
 - 2. Extended Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ELECTRONIC TIME SWITCHES

- 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. Cooper Industries, Inc.
 - 2. Leviton Manufacturing Co., Inc.
 - 3. TE Connectivity Ltd.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Programs:
 - a. Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
 - 3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
 - 4. Astronomic Time
 - 5. Automatic daylight savings time changeover.
 - 6. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.02 INDOOR OCCUPANCY AND VACANCY SENSORS

- 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. Cooper Industries, Inc.
 2. Leviton Manufacturing Co., Inc.
 3. WattStopper; Legrand North America, LLC.
- B. General Requirements for Sensors:
1. Wall or Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
 2. Passive infrared or Ultrasonic or Dual technology.
 3. Integrated or Separate power pack.
 4. [
 5. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 6. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 7. Power: Line voltage.
 8. Power Pack: Dry contacts rated for 20 A or LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
 9. Mounting:
 - a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
 - b. Relay: Externally mounted through a 1/2 inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 11. Bypass Switch: Override the "on" function in case of sensor failure.
 12. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Wall or Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch.
 2. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 ft. when mounted on a 10 ft. high ceiling.
- D. Ultrasonic Type: Wall or Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96 inch high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96 inch high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96 inch high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 ft. when mounted on a 10 ft. high ceiling in a corridor not wider than 14 ft..
 6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. when mounted 84 inch above finished floor.
- E. Dual-Technology Type: Wall or Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch, and detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96 inch high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. when mounted 48 inch above finished floor.

2.03 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- 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. Cooper Industries, Inc.
 2. Leviton Manufacturing Co., Inc.
 3. WattStopper; Legrand North America, LLC.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox using hardwired connection.
1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application, and must comply with California Title 24.

2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
4. Switch Rating: Not less than 800 VA LED load at 120 V, 1200 VA LED load at 277 V, and 800 W incandescent.

C. Wall-Switch Sensor Tag WS1:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.
3. Switch Type: SP, manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Match the circuit voltage.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Faceplate: Color matched to switch.

D. Wall-Switch Sensor Tag WS2:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.
3. Switch Type: SP, manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Match the circuit voltage.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Faceplate: Color matched to switch.

2.04 OUTDOOR MOTION SENSORS

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. Cooper Industries, Inc.
2. Leviton Manufacturing Co., Inc.
3. WattStopper; Legrand North America, LLC.

B. Description: Solid-state outdoor motion sensors.

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application, and must comply with California Title 24.

2. PIR or Dual-technology (PIR and ultrasonic) type, weatherproof. Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch. Comply with UL 773A.
3. Switch Rating:
 - a. Luminaire-Mounted Sensor: 1000 W incandescent, 500 VA fluorescent/LED.
 - b. Separately Mounted Sensor: Dry contacts rated for 20 A LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
4. Switch Type: SP, manual "on," automatic "off." With bypass switch to override the "on" function in case of sensor failure.
5. Voltage: Match the circuit voltage type.
6. Detector Coverage:
 - a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
 - b. Long Range: 180-degree field of view and 110 ft. detection range.
7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.
10. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F, rated as "raintight" in accordance with UL 773A.

2.05 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.01 INSTALLATION OF SENSORS

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3.02 INSTALLATION OF CONTACTORS

- A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.03 INSTALLATION OF WIRING

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
- C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.04 IDENTIFICATION

- A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.
- B. Label time switches and contactors with a unique designation.

3.05 FIELD QUALITY CONTROL

- A. Field tests must be witnessed by Architect.
- B. Tests and Inspections:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Nonconforming Work:
 - 1. Lighting control devices will be considered defective if they do not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- D. Prepare test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to supervise field tests and inspections.

3.06 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.07 MAINTENANCE

A. Software and Firmware Service Agreement:

1. Technical Support: Beginning at Substantial Completion, verify that software and firmware service agreement includes software support for two years.
2. Upgrade Service: At Substantial Completion, update software and firmware to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Verify upgrading software includes operating system and new or revised licenses for using software.
 - a. Upgrade Notice: No fewer than 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.
3. Upgrade Reports: Prepare written report after each update, documenting upgrades installed.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.

1.02 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Detail utility company's metering provisions with indication of approval by utility company.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.
8. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Delegated Design Submittal:

1. For arc-flash hazard analysis.
2. For arc-flash labels.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

- B. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- 1.04 Field quality-control reports.
- 1.05 CLOSEOUT SUBMITTALS
 - A. Operation and maintenance data.
- 1.06 QUALITY ASSURANCE
 - A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
 - B. Testing Agency Qualifications: Member company of NETA or an NRTL.
- 1.07 FIELD CONDITIONS
 - A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
 - B. Environmental Limitations:
 - 1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.
- 1.08 WARRANTY
 - A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.

- B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
 - 2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.02 SWITCHBOARDS

- 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. Eaton.
 - 2. Siemens Industry, Inc., Energy Management Division.
 - 3. Square D; Schneider Electric USA.
- B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Comply with NEMA PB 2.
- E. Comply with NFPA 70.
- F. Comply with UL 891.
- G. Front-Connected, Front-Accessible Switchboards:
 - 1. Main Devices: Panel mounted.
 - 2. Branch Devices: Panel mounted.
 - 3. Sections front and rear aligned.
- H. Nominal System Voltage: Refer to drawings.
- I. Main-Bus Continuous: Refer to drawings.

- J. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Seismic Controls for Electrical Systems."
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- K. Indoor Enclosures: Steel, NEMA 250, Type 1.
- L. Outdoor Enclosures: Type 3R.
1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
 2. Enclosure: Flat roof; bolt-on rear covers for each section, with provisions for padlocking.
 3. Doors: Personnel door at each end of aisle, minimum width of 30 inches; opening outwards; with panic hardware and provisions for padlocking. At least one door shall be sized to permit the largest single switchboard section to pass through without disassembling doors, hinges, or switchboard section.
 4. Accessories: LED luminaires, ceiling mounted; wired to a three-way light switch at each end of aisle; ground-fault circuit interrupter (GFCI) duplex receptacle; emergency battery pack luminaire installed on wall of aisle midway between personnel doors.
 5. Walk-in Aisle Heating and Ventilating:
- M. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.
- N. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.
- O. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- P. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
- Q. Buses and Connections: Three phase, four wire unless otherwise indicated.
1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
 2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
 3. Tin-plated aluminum feeder circuit-breaker line connections.
 4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors.

- Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
5. Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
 6. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
- R. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.03 SURGE PROTECTION DEVICES

- 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. Eaton.
 2. Siemens Industry, Inc., Energy Management Division.
 3. Square D; Schneider Electric USA.
- B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.
- C. Features and Accessories:
- D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- E. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120V, three-phase, four-wire circuits shall not exceed the following:
1. Line to Neutral: 700 V for 208Y/120V.
 2. Line to Ground: 1200 V for 208Y/120V.
 3. Line to Line: 1000 V for 208Y/120V.

2.04 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits for breakers below 400A Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting
 3. Electronic trip circuit breakers for breakers 400A and above, with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

- a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long and short time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
- 4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
- 5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
- 6. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
 - f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - h. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 - i. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

2.05 INSTRUMENTATION

- A. Instrument Transformers: NEMA EI 21.1, and the following:
 - 1. Current Transformers: NEMA EI 21.1; 5 A, 60 Hz, secondary; wound type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
 - 2. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
 - 3. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.
- B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
 - 1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
 - a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
 - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
 - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
 - d. Megawatts: Plus or minus 1 percent.
 - e. Megavars: Plus or minus 1 percent.

- f. Power Factor: Plus or minus 1 percent.
 - g. Frequency: Plus or minus 0.1 percent.
 - h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
 - i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
 - j. Contact devices to operate remote impulse-totalizing demand meter.
 - 2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.
- C. Watt-Hour Meters and Wattmeters:
- 1. Comply with ANSI C12.1.
 - 2. Three-phase induction type with two stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
 - 3. Suitable for connection to three- and four-wire circuits.
 - 4. Potential indicating lamps.
 - 5. Adjustments for light and full load, phase balance, and power factor.
 - 6. Four-dial clock register.
 - 7. Ratchets to prevent reverse rotation.
 - 8. Removable meter with drawout test plug.
 - 9. Semiflush mounted case with matching cover.
 - 10. Appropriate multiplier tag.
- D. Impulse-Totalizing Demand Meter:
- 1. Comply with ANSI C12.1.
 - 2. Suitable for use with switchboard watt-hour meter, including two-circuit totalizing relay.
 - 3. Cyclometer.
 - 4. Four-dial, totalizing kilowatt-hour register.
 - 5. Positive chart drive mechanism.
 - 6. Capillary pen holding a minimum of one month's ink supply.
 - 7. Roll chart with minimum 31-day capacity; appropriate multiplier tag.
 - 8. Capable of indicating and recording five-minute integrated demand of totalized system.

2.06 CONTROL POWER

2.07 IDENTIFICATION

- A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Receive, inspect, handle, and store switchboards according to NECA 400.

- B. Install switchboards and accessories according to NECA 400.
- C. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
 - 1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to switchboards.
 - 6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.
- E. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- F. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- G. Install filler plates in unused spaces of panel-mounted sections.
- H. Install overcurrent protective devices, surge protection devices, and instrumentation.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- I. Install spare-fuse cabinet.
- J. Comply with NECA 1.

3.02 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.03 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Acceptance Testing:

- a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
 - b. Test continuity of each circuit.
2. Test ground-fault protection of equipment for service equipment per NFPA 70.
 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

B. Switchboard will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.04 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

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SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.02 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.
7. Key interlock scheme drawing and sequence of operations.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.04 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.05 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.06 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Height: 84 inches maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
- F. Incoming Mains Location: Convertible between top and bottom.
- G. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.

3. Ground Lugs and Bus-Configured Terminators: type, with a lug on the bar for each pole in the panelboard.
 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 6. .
- I. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
 - J. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
 - K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity. Ratings as shown on drawings.

2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.03 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton.
 2. Siemens Industry, Inc., Energy Management Division.
 3. Square D; Schneider Electric USA.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: Circuit breaker.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. Siemens Industry, Inc., Energy Management Division.
 - 3. Square D; Schneider Electric USA.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- 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. Eaton.
 - 2. Siemens Industry, Inc., Energy Management Division.
 - 3. Square D; Schneider Electric USA.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers for breakers under 400A :
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic Trip Circuit Breakers for breakers 400A and above:
 - a. RMS sensing.
 - b. Field-replaceable rating plug or electronic trip.
 - c. Digital display of settings, trip targets, and indicated metering displays.
 - d. Multi-button keypad to access programmable functions and monitored data.
 - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
 - f. Integral test jack for connection to portable test set or laptop computer.
 - g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.06 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

2.07 ACCESSORY COMPONENTS AND FEATURES

- A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NECA 407.
- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Mount top of trim 90 inches above finished floor unless otherwise indicated.

- E. Mount panelboard cabinet plumb and rigid without distortion of box.
- F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- H. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- I. Install filler plates in unused spaces.

3.02 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

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SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. USB receptacles.
3. GFCI receptacles, 125 V, 20 A.
4. Toggle switches, 120/277 V, 20 A.
5. Decorator-style devices, 20 A.
6. Occupancy sensors.
7. Digital timer light switches.
8. Residential devices.
9. Wall-box dimmers.
10. Wall plates.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.03 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.01 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.

- E. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Essential Electrical System: Red.
 - 3. SPD Devices: Blue.
- F. Wall Plate Color: For plastic covers, match device color.
- G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

- A. Duplex Receptacles, 125 V, 20 A
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
 - 2. Description: Two pole, three wire, and self-grounding.
 - 3. Configuration: NEMA WD 6, Configuration 5-20R.
 - 4. Standards: Comply with UL 498 and FS W-C-596.
- B. Tamper-Resistant Duplex Receptacles, 125 V, 20 A:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
 - 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
 - 3. Configuration: NEMA WD 6, Configuration 5-20R.
 - 4. Standards: Comply with UL 498 and FS W-C-596.
 - 5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.
- C. Weather-Resistant Duplex Receptacle, 125 V, 20 A
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.

- b. Leviton Manufacturing Co., Inc.
- c. Pass & Seymour; Legrand North America, LLC.
- d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
- 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
- 3. Configuration: NEMA WD 6, Configuration 5-20R.
- 4. Standards: Comply with UL 498.
- 5. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
- 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
- 3. Configuration: NEMA WD 6, Configuration 5-20R.
- 4. Standards: Comply with UL 498.
- 5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.03 USB RECEPTACLES

A. USB Charging Receptacles:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
- 2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
- 3. USB Receptacles: Dual, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
- 4. Standards: Comply with UL 1310 and USB 3.0 devices.

B. Tamper-Resistant Duplex and USB Charging Receptacles:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.

- d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.
3. Line Voltage Receptacles: Two pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
4. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
5. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.
6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

2.04 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Non-feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Pass & Seymour; Legrand North America, LLC.
 - b. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Non-feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.

- b. Leviton Manufacturing Co., Inc.
- c. Pass & Seymour; Legrand North America, LLC.
- d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
- 2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
- 3. Configuration: NEMA WD 6, Configuration 5-15R.
- 4. Type: Non-feed through.
- 5. Standards: Comply with UL 498 and UL 943 Class A.
- 6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.05 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
- 2. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 20 A:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
- 2. Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 20 A:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
- 2. Comply with UL 20 and FS W-S-896.

2.06 DECORATOR-STYLE DEVICES, 20 A

A. Decorator Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Two pole, three wire, and self-grounding. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.

B. Decorator Tamper-Resistant Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Decorator, Tamper- and Weather-Resistant, Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

D. Decorator Single-Pole Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Comply with UL 20.

2.07 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Lighting Wavelinx
2. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
3. Standards: Comply with UL 20.
4. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
5. Adjustable time delay of 10 minutes.
6. Able to be locked to Automatic-On mode.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
8. Connections: Provisions for connection to BAS.
9. Connections: RJ-45 communications outlet.
10. Connections: Integral wireless networking.

2.08 DIMMERS

A. Wall-Box Dimmers:

1. Cooper Lighting Wavelinx
2. Description: Modular, full-wave, solid-state dimmer switch with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
3. Control: Continuously adjustable toggle buttons; with single-pole or three-way switching.
4. Standards: Comply with UL 1472.
5. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
 - a. 600 W; dimmers shall require no derating when ganged with other devices.
6. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
7. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.09 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 3. Install wiring devices after all wall preparation, including painting, is complete.
- C. Device Installation:
 - 1. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- D. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
 - 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- F. Dimmers:
 - 1. Install dimmers within terms of their listing.
 - 2. Verify that dimmers used for fan-speed control are listed for that application.

3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.02 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. In healthcare facilities, prepare reports that comply with NFPA 99.
 2. Test Instruments: Use instruments that comply with UL 1436.
 3. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

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SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Control circuits.
 - b. Panelboards.
 - c. Switchboards.
 - d. Enclosed controllers.
 - e. Enclosed switches.
 - f. Electrical Disconnects

1.02 ACTION SUBMITTALS

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

1.03 CLOSEOUT SUBMITTALS

- ###### A. Operation and maintenance data.

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. Bussmann; Eaton, Electrical Sector.
2. Littelfuse, Inc.
3. Mersen USA.

2.02 CARTRIDGE FUSES

- ###### A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 250 or 600-V, zero- to 600-A rating, 200 kAIC.
2. Type RK-5: 250 or 600 -V, zero- to 600-A rating, 200 kAIC.
3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC.

4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC.
 5. Type J: 600-V, zero- to 600-A rating, 200 kAIC.
 6. Type T: 250-V, zero- to and 1200-A 600-V, zero- to 800-A rating, 200 kAIC.
-
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - C. Comply with NEMA FU 1 for cartridge fuses.
 - D. Comply with NFPA 70.
 - E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location shown on the Drawings.

3.02 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

1.02 DEFINITIONS

A. GFEP: Ground-fault circuit-interrupter for equipment protection.

B. GFLS: Ground-fault circuit-interrupter for life safety.

1.03 ACTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

- C. Field Quality-Control Submittals:
 - 1. Field quality-control reports.

1.04 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

1.05 CLOSEOUT SUBMITTALS

- A. Warranty documentation.

1.06 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
 - 1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.02 FUSIBLE SWITCHES

- 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. ABB Electrification Installations Products.
 - 2. Eaton.
 - 3. Square D; Schneider Electric USA.
- B. Type HD, Heavy Duty:
 - 1. Single throw.
 - 2. Three pole.
 - 3. 240 V(ac).
 - 4. 1200 A and smaller.

5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.

2.03 NONFUSIBLE SWITCHES

- 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. ABB Electrification Installations Products.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.

- B. Type GD, General Duty, Three Pole, Single Throw, 240 V(ac), 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

- C. Type HD, Heavy Duty, Three Pole, Single Throw, 240 V(ac), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.

2.04 MOLDED-CASE CIRCUIT BREAKERS

- 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. ABB Electrification Installations Products.
2. Eaton.

3. Square D; Schneider Electric USA.

- B. Circuit breakers must be constructed using glass-reinforced insulating material. Current carrying components must be completely isolated from handle and accessory mounting area.
- C. Circuit breakers must have toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. Circuit-breaker handle must be over center, be trip free, and reside in tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon must be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with push-to-trip button, located on face of circuit breaker to mechanically operate circuit-breaker tripping mechanism for maintenance and testing purposes.
- D. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings must be clearly marked on face of circuit breaker. Circuit breakers must be 100 percent rated.
- E. MCCBs must be equipped with device for locking in isolated position.
- F. Lugs must be suitable for 75 deg C rated wire.
- G. Standard: Comply with UL 489 with required interrupting capacity for available fault currents.
- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- I. Electronic Trip Circuit Breakers: Field-replaceable rating plug, RMS sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I-squared t response.
- J. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- K. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 4. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
 - 5. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.05 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.

- B. Enclosure Finish: Enclosure must be a brush finish on Type 304 stainless steel (UL 50E Type 4-4X stainless steel).
- C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: Circuit-breaker operating handle must be externally operable with operating mechanism being integral part of box, not cover. Cover interlock mechanism must have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.
- E. Enclosures designated as UL 50E Type 4, 4X stainless steel, 12, or 12K must have dual cover interlock mechanism to prevent unintentional opening of enclosure cover when circuit breaker is ON and to prevent turning circuit breaker ON when enclosure cover is open.
- F. UL 50E Type 7/9 enclosures must be furnished with breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.01 SELECTION OF ENCLOSURES

- A. Indoor, Dry and Clean Locations: UL 50E, Type 1.
- B. Outdoor Locations: UL 50E, Type 4X.
- C. Kitchen Areas: UL 50E, Type 4X, stainless steel.
- D. Other Wet or Damp, Indoor Locations: UL 50E, Type 4.
- E. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 12.

3.02 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
 - 1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
 - 2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
 - 3. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
 - 4. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
 - 5. Install fuses in fusible devices.

3.03 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.04 FIELD QUALITY CONTROL

- A. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.
 - g. Inspect bolted electrical connections for high resistance using one of the following methods:
 - 1) Use low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
 - i. Verify correct phase barrier installation.
 - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
 - 2. Electrical Tests:
 - a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
 - b. Measure contact resistance across each switchblade fuseholder. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
 - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage

in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

- d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- e. Perform ground fault test in accordance with NETA ATS Section 7.14 "Ground Fault Protection Systems, Low-Voltage."

B. Tests and Inspections for Molded-Case Circuit Breakers:

1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data are as described in the Specifications and shown on Drawings.
- b. Inspect physical and mechanical condition.
- c. Inspect anchorage, alignment, grounding, and clearances.
- d. Verify that unit is clean.
- e. Operate circuit breaker to ensure smooth operation.
- f. Inspect bolted electrical connections for high resistance using one of the following methods:
 - 1) Use low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
- g. Inspect operating mechanism, contacts, and chutes in unsealed units.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- c. Perform contact/pole resistance test. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

- d. Perform insulation resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values may be no less than 2 MΩ.
- e. Determine the following by primary current injection:
 - 1) Long-time pickup and delay. Pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 2) Short-time pickup and delay. Short-time pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 3) Ground-fault pickup and time delay. Ground-fault pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 4) Instantaneous pickup. Instantaneous pickup values must be as specified and within manufacturer's published tolerances.

3. Test and adjust controls, remote monitoring, and safeties.

C. Nonconforming Work:

- 1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- 2. Remove and replace defective units and retest.

D. Collect, assemble, and submit test and inspection reports.

- 1. Test procedures used.
- 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
- 3. List deficiencies detected, remedial action taken, and observations after remedial action.

E. Manufacturer Services:

- 1. Engage factory-authorized service representative to support field tests and inspections.

3.05 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 26 32 13.13

DIESEL-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes packaged engine generators used to supply non-emergency power, with the following features:
 - 1. Diesel engine.
 - 2. Diesel fuel-oil system.
 - 3. Control and monitoring.
 - 4. Generator overcurrent and fault protection.
 - 5. Generator, exciter, and voltage regulator.
 - 6. Vibration isolation devices.
- B. Related Requirements:
 - 1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Identify fluid drain ports and clearance requirements for proper fluid drain.
 - 4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
 - 6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.

1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer and testing agency.

- B. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.06 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

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. Caterpillar, Inc.; Electric Power Division.
 - 2. Kohler Power Systems.
 - 3. MTU America Inc.

2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Engine generator housing, subbase fuel tank, engine generator, batteries, battery racks, silencers, sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst-case normal levels.
 3. Component Importance Factor: 1.5.
- B. B11 Compliance: Comply with B11.19.
- C. NFPA Compliance:
1. Comply with NFPA 37.
 2. Comply with NFPA 70.
 3. Comply with NFPA 110 requirements for Level 1 EPSS.
- D. UL Compliance: Comply with UL 2200.
- E. Engine Exhaust Emissions: Comply with EPA Tier 4 requirements and applicable state and local government requirements.
- F. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- G. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
1. Ambient Temperature: 41 to 104 deg F.
 2. Relative Humidity: Zero to 95 percent.
 3. Altitude: Sea level to 1000 feet 5000.

2.03 ENGINE GENERATOR ASSEMBLY DESCRIPTION

- A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Power Rating: Standby.
- D. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.
- E. EPSS Class: Engine generator shall be classified as a Class 48 according to NFPA 110.
- F. Service Load: As shown on drawings.
- G. Power Factor: Insert number.9, lagging.
- H. Frequency: 60 Hz.

- I. Voltage: As shown on drawings
- J. Phase: Three-phase, four wire, wye.
- K. Induction Method: Naturally aspirated.
- L. Governor: Adjustable isochronous, with speed sensing.
- M. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
 - 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.
- N. Capacities and Characteristics:
 - 1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries, with capacity as required to operate as a unit as evidenced by records of prototype testing.
 - 2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- O. Engine Generator Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
 - 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
 - 6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
 - 7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
 - 8. Start Time:
 - a. Comply with NFPA 110, Type 10 system requirements.

2.04 DIESEL ENGINE

- A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.
- B. Rated Engine Speed: 1800 rpm.
- C. Lubrication System: Engine or skid-mounted.
 - 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
 - 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
 - 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.
- E. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.
 - 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 - 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 - 3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 - 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 - 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.
 - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- F. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - 1. Minimum sound attenuation of 25 dB at 500 Hz.
 - 2. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 85 dBA or less.
- G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- H. Starting System: 12or 24-V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Nickel cadmium], with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least twice without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for nickel-cadmium batteries. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
 - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.05 DIESEL FUEL-OIL SYSTEM

- A. Comply with NFPA 37.
- B. Piping: Fuel-oil piping shall be Schedule 40 black steel. Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.
- C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.
- D. Fuel Filtering: Remove water and contaminants larger than 1 micron.

- E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
 - 1. Fuel Tank Capacity: Minimum 133 percent of total fuel required for periodic maintenance operations between fuel refills plus fuel for the hours of continuous operation required for the indicated EPSS Class..
- F. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:
 - 1. Tank level indicator.
 - 2. Fuel-Tank Capacity: Minimum 133 percent of total fuel required for planned operation plus fuel for periodic maintenance operations between fuel refills.
 - 3. Leak detection in interstitial space.
 - 4. Vandal-resistant fill cap.
 - 5. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.06 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- C. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.
- D. Comply with UL 508A.
- E. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.
- F. Control and Monitoring Panel:
 - 1. Digital engine generator controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
 - 2. Instruments: Located on the control and monitoring panel and viewable during operation.
 - a. Engine lubricating-oil pressure gage.
 - b. Engine-coolant temperature gage.
 - c. DC voltmeter (alternator battery charging).

- d. Running-time meter.
 - e. AC voltmeter, for each phase .
 - f. AC ammeter, for each phase.
 - g. AC frequency meter.
 - h. Generator-voltage adjusting rheostat.
3. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:
- a. Cranking control equipment.
 - b. Run-Off-Auto switch.
 - c. Control switch not in automatic position alarm.
 - d. Overcrank alarm.
 - e. Overcrank shutdown device.
 - f. Low-water temperature alarm.
 - g. High engine temperature.
 - h. High engine temperature shutdown device.
 - i. Overspeed alarm.
 - j. Overspeed shutdown device.
 - k. Low fuel main tank.
- 1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required for the indicated EPSS class.
- l. Coolant low-level alarm.
 - m. Coolant low-level shutdown device.
 - n. Coolant high-temperature prealarm.
 - o. Coolant high-temperature alarm.
 - p. Coolant low-temperature alarm.
 - q. Coolant high-temperature shutdown device.
 - r. EPS load indicator.
 - s. Battery high-voltage alarm.
 - t. Low cranking voltage alarm.
 - u. Battery-charger malfunction alarm.
 - v. Battery low-voltage alarm.
 - w. Lamp test.
 - x. Contacts for local and remote common alarm.
 - y. Low-starting air pressure alarm.
 - z. Low-starting hydraulic pressure alarm.
 - aa. Remote manual stop shutdown device.
 - bb. Air shutdown damper alarm when used.
 - cc. Air shutdown damper shutdown device when used.
 - dd. Generator overcurrent-protective-device not-closed alarm.
 - ee. Hours of operation.
 - ff. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.
- G. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.
- H. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect

so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Low water-temperature alarm.
3. High engine temperature prealarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.
18. Low-cranking voltage alarm.
19. Generator overcurrent-protective-device not-closed alarm.

- I. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.
- J. Remote Emergency-Stop Switch: Flush; wall mounted unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.07 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.
 1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
 2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.
- B. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with UL 489.
 1. Tripping Characteristic: Designed specifically for generator protection.
 2. Trip Rating: Matched to generator output rating.
 3. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
 4. Mounting: Adjacent to, or integrated with, control and monitoring panel.
- C. Generator Disconnect Switch: Molded-case type; 100 percent rated.

1. Trip Rating: Matched to generator output rating.
 2. Shunt Trip: Connected to trip switch when signaled by generator protector or by other protective devices.
- D. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.
1. Indicate ground fault with other engine generator alarm indications.
 2. Trip generator protective device on ground fault.

2.08 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H or Class F.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Enclosure: Dripproof.
- G. Instrument Transformers: Mounted within generator enclosure.
- H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified[
1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
- I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- K. Subtransient Reactance: 12 percent, maximum.

2.09 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
1. Material: Standard neoprene separated by steel shims.
 2. Shore A Scale Durometer Rating: 30.
 3. Number of Layers: Two.

- B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
 - 1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch-thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment-mounting and -leveling bolt that acts as blocking during installation.
 - 2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.010 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Architect, Construction Manager, and Owner no fewer than two working days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Architect's, Construction Manager's, and Owner's written permission.
- B. Comply with NECA 1 and NECA 404.
- C. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.
- D. Equipment Mounting:
 - 1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
 - 3. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch on 4-inch-high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Section 260548.16 "Seismic Controls for Electrical Systems."

- E. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- F. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.
- G. Fuel Piping:
 - 1. Copper and galvanized steel shall not be used in the fuel-oil piping system.
- H. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.02 IDENTIFICATION

- A. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
Tests and Inspections:
 - 1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.
 - a. Visual and Mechanical Inspection:
 - 1) Compare equipment nameplate data with Drawings and the Specifications.
 - 2) Inspect physical and mechanical condition.
 - 3) Inspect anchorage, alignment, and grounding.
 - 4) Verify that the unit is clean.
 - b. Electrical and Mechanical Tests:
 - 1) Perform insulation-resistance tests according to IEEE 43.
 - a) Machines Larger Than 200 hp: Test duration shall be 10 minutes. Calculate polarization index.
 - b) Machines 200 hp or Less: Test duration shall be one minute. Calculate the dielectric-absorption ratio.
 - 2) Test protective relay devices.
 - 3) Verify phase rotation, phasing, and synchronized operation as required by the application.
 - 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
 - 5) Perform vibration test for each main bearing cap.
 - 6) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
 6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
 7. Exhaust Emissions Test: Comply with applicable government test criteria.
 8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
 9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
- B. Coordinate tests with tests for transfer switches and run them concurrently.
 - C. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
 - D. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
 - E. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
 - F. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - G. Remove and replace malfunctioning units and retest as specified above.
 - H. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.
 - I. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

SECTION 26 36 00
TRANSFER SWITCHES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes automatic and nonautomatic transfer switches rated 600 V and less.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
 - 2. Single-Line Diagram: Show connections between transfer switch, power sources, and load.

1.03 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: Certificates, for transfer switches, accessories, and components, from manufacturer.
- B. Source quality control reports.
- C. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.05 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA ICS 1.
- C. Comply with NFPA 110.
- D. Comply with UL 1008 unless requirements of these Specifications are stricter.
- E. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- F. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
 - 1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
 - 2. Short-time withstand capability for three cycles.
- G. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- H. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- I. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.
- J. Neutral Switching: Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.
- K. Neutral Terminal: Solid and fully rated unless otherwise indicated.
 - 1. Float type, rated 2 A.
 - 2. Ammeter to display charging current.
 - 3. Fused ac inputs and dc outputs.
- L. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
 4. Accessible via rear access.
- M. Enclosures: General-purpose NEMA 250, Type 3R, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.02 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

- 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. Caterpillar, Inc.; Electric Power Division.
 2. Kohler Power Systems.
 3. MTU America Inc.
- B. Comply with Level 1 equipment according to NFPA 110.
- C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
 2. Switch Action: Double throw; mechanically held in both directions.
 3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
 4. Conductor Connectors: Suitable for use with conductor material and sizes.
 5. Material: Hard-drawn copper, 98 percent conductivity.
 6. Main and Neutral Lugs: Mechanical type.
 7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 8. Connectors shall be marked for conductor size and type according to UL 1008.
- D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.
1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
- E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.
- F. Automatic Transfer-Switch Controller Features:
1. Controller operates through a period of loss of control power.
 2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is unavailable.

G. Large-Motor-Load Power Transfer:

1. In-Phase Monitor: Factory-wired, internal relay controls transfer so contacts close only when the two sources are synchronized in phase and frequency. Relay shall compare phase relationship and frequency difference between normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
2. Motor Disconnect and Timing Relay Controls: Designated starters in loss of power scenario shall disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters shall be through wiring external to automatic transfer switch. Provide adjustable time delay between 1 and 60 seconds for reconnecting individual motor loads. Provide relay contacts rated for motor-control circuit inrush and for actual seal currents to be encountered.

3. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

2.03 MOLDED-CASE-TYPE AUTOMATIC TRANSFER SWITCHES

- 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. Caterpillar, Inc.; Electric Power Division.
 2. Kohler Power Systems.
- B. Comply with Level 1 equipment according to NFPA 110.
- C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 1. Limitation: Switches using contactor-based components are unacceptable.
 2. Switch Action: Double throw; mechanically held in both directions.
 3. Contacts: Silver composition or silver alloy for load-current switching.
 4. Conductor Connectors: Suitable for use with conductor material and sizes.
 5. Material: Hard-drawn copper, 98 percent conductivity.
 6. Main and Neutral Lugs: Mechanical type.
 7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 8. Ground bar.
 9. Connectors shall be marked for conductor size and type according to UL 1008.
- D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.
 1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
- E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.
- F. Transfer Switches Based on Molded-Case-Switch Components: Comply with UL 489 and UL 869A.
- G. Automatic Transfer-Switch Controller Features:
 1. Controller operates through a period of loss of control power.
 2. Undervoltage Sensing for Each Phase of Normal and Alternative Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
 3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is unavailable.

2.04 NONAUTOMATIC TRANSFER SWITCHES

- 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. Caterpillar, Inc.; Electric Power Division.
 2. Eaton.
 3. Russelectric, Inc.
- B. Electrically Operated: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.
- C. Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.

- D. Pilot Lights: Indicate source to which load is connected.
- E. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and alternative-source sensing circuits.
 - 1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - 2. Emergency Power Supervision: Red light with nameplate engraved "Alternative Source Available."
- F. Unassigned Auxiliary Contacts: Switch shall have one set of normally closed contacts for each switch position, rated 10 A at 240-V ac.
- G. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Switch Action: Double throw; mechanically held in both directions.
 - 2. Contacts: Silver composition or silver alloy for load-current switching.
 - 3. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 4. Material: Hard-drawn copper, 98 percent conductivity.
 - 5. Main and Neutral Lugs: Mechanical type.
 - 6. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 - 7. Ground bar.
 - 8. Connectors shall be marked for conductor size and type according to UL 1008.

2.05 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.
- B. Prepare test and inspection reports.
 - 1. For each of the tests required by UL 1008, performed on representative devices, for legally required systems. Include results of test for the following conditions:
 - a. Overvoltage.
 - b. Undervoltage.
 - c. Loss of supply voltage.
 - d. Reduction of supply voltage.
 - e. Alternative supply voltage or frequency is at minimum acceptable values.
 - f. Temperature rise.
 - g. Dielectric voltage-withstand; before and after short-circuit test.
 - h. Overload.
 - i. Contact opening.
 - j. Endurance.
 - k. Short circuit.
 - l. Short-time current capability.
 - m. Receptacle withstand capability.
 - n. Insulating base and supports damage.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Floor-Mounting Switch: Anchor to floor by bolting.
 - 1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
 - 3. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
 - 4. Provide workspace and clearances required by NFPA 70.
- B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.
- C. Identify components according to Section 260553 "Identification for Electrical Systems."
- D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.
- E. Comply with NECA 1.

3.02 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.
 - 1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect twisted pair cable according to Section 271513 "Communications Copper Horizontal Cabling."
- F. Route and brace conductors according to manufacturer's written instructions[,] and Section 260529 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.
- G. Brace and support equipment according to Section 260548.16 "Seismic Controls for Electrical Systems."

- H. Final connections to equipment shall be made with liquidtight, flexible metallic conduit no more than 18 inches in length.

3.03 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

- 1. Visual and Mechanical Inspection:

- a. Compare equipment nameplate data with Drawings and Specifications.
- b. Inspect physical and mechanical condition.
- c. Inspect anchorage, alignment, grounding, and required clearances.
- d. Verify that the unit is clean.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Verify that manual transfer warnings are attached and visible.
- g. Verify tightness of all control connections.
- h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:
 - 1) Use of low-resistance ohmmeter.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
- i. Perform manual transfer operation.
- j. Verify positive mechanical interlocking between normal and alternate sources.
- k. Perform visual and mechanical inspection of surge arresters.
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.

- 2. Electrical Tests:

- a. Perform insulation-resistance tests on all control wiring with respect to ground.
- b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
- c. Verify settings and operation of control devices.
- d. Calibrate and set all relays and timers.
- e. Verify phase rotation, phasing, and synchronized operation.
- f. Perform automatic transfer tests.
- g. Verify correct operation and timing of the following functions:
 - 1) Normal source voltage-sensing and frequency-sensing relays.
 - 2) Engine start sequence.
 - 3) Time delay on transfer.
 - 4) Alternative source voltage-sensing and frequency-sensing relays.
 - 5) Automatic transfer operation.

- 6) Interlocks and limit switch function.
 - 7) Time delay and retransfer on normal power restoration.
 - 8) Engine cool-down and shutdown feature.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
 4. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
 - f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
 5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
 - a. Verify grounding connections and locations and ratings of sensors.
- B. Coordinate tests with tests of generator and run them concurrently.
 - C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
 - D. Transfer switches will be considered defective if they do not pass tests and inspections.
 - E. Remove and replace malfunctioning units and retest as specified above.
 - F. Prepare test and inspection reports.
 - G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

3.04 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.
- B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.
- C. Coordinate this training with that for generator equipment.

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SECTION 26 51 19
LED INTERIOR LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes the following types of LED luminaires:
 - 1. Downlight.
 - 2. Recessed, linear.
 - 3. Strip light.
 - 4. Surface mount, linear.
 - 5. Surface mount, nonlinear.
- B. See electrical drawings for all LED interior light fixture manufacturers and models.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.03 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved.
- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of luminaire.
- D. Product test reports.
- E. Sample warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.05 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

- B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.06 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."
- B. Ambient Temperature: 41 to 104 deg F.
 - 1. Relative Humidity: Zero to 95 percent.
- C. Altitude: Sea level to 1000 feet <

2.02 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.
- D. California Title 24 compliant.

- 2.03 DOWNLIGHT: See electrical drawings for type, manufacturer, and model.
- 2.04 RECESSED, LINEAR: See electrical drawings for type, manufacturer, and model.
- 2.05 STRIP LIGHT: See electrical drawings for type, manufacturer, and model.
- 2.06 SURFACE MOUNT, LINEAR: See electrical drawings for type, manufacturer, and model.
- 2.07 SURFACE MOUNT, NONLINEAR: See electrical drawings for type, manufacturer, and model.
- 2.08 HIGH BAY: See electrical drawings for type, manufacturer, and model.
- 2.09 CYLINDER: See electrical drawings for type, manufacturer, and model.
- 2.010 TROFFER: See electrical drawings for type, manufacturer, and model.
- 2.011 STEP: See electrical drawings for type, manufacturer, and model.
- 2.012 VANITY: See electrical drawings for type, manufacturer, and model.
- 2.013 UNDERCOUNTER: See electrical drawings for type, manufacturer, and model.
- 2.014 EXIT: See electrical drawings for type, manufacturer, and model.
- 2.015 MATERIALS
 - A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
 - B. Steel:
 - 1. ASTM A36/A36M for carbon structural steel.
 - 2. ASTM A568/A568M for sheet steel.
 - C. Stainless Steel:
 - 1. 1. Manufacturer's standard grade.
 - 2. 2. Manufacturer's standard type, ASTM A240/240M.

- D. Galvanized Steel: ASTM A653/A653M.
- E. Aluminum: ASTM B209.

2.016 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.017 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.02 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.03 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

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SECTION 26 56 19
LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.02 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports and seismic restraints.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale and coordinated.
- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of the following:
 1. Luminaire.
 2. Photoelectric relay.
- D. Sample warranty.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
 2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.06 FIELD CONDITIONS

- A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.07 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.02 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- F. CRI of minimum 70. CCT Refer to Luminaire Schedule on drawings..
- G. L70 lamp life of 50,000 hours.
- H. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- I. Nominal Operating Voltage: 120 V ac or 277 V ac.
- J. In-line Fusing: On the primary for each luminaire.
- K. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.
- L. Source Limitations:
 - 1. Obtain luminaires from single source from a single manufacturer.
 - 2. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.03 LUMINAIRE TYPES

- A. Area and Site:
 - 1. Refer to Luminaire Schedule on drawings.
- B. Canopy:
 - 1. Refer to Luminaire Schedule on drawings.
- C. Decorative Post Top:
 - 1. Refer to Luminaire Schedule on drawings.
- D. Flood:
 - 1. Refer to Luminaire Schedule on drawings.
- E. Sconce:
 - 1. Refer to Luminaire Schedule on drawings.

2.04 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum or Stainless steel. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- G. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.

2.05 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

a. Color: as selected by Architect.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color:

- 1) As selected from manufacturer's standard catalog of colors.
- 2) Match Architect's sample of manufacturer's standard color.
- 3) As selected by Architect from manufacturer's full range.

2.06 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
 1. Sized and rated for luminaire weight.

2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to a minimum 1/8 inch backing plate attached to wall structural members.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.02 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.03 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.04 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.05 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - a. IES LM-5.
 - b. IES LM-50.
 - c. IES LM-52.
 - d. IES LM-64.
 - e. IES LM-72.
2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.06 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

END OF SECTION

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SECTION 27 05 26

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.02 ACTION SUBMITTALS

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

1.03 INFORMATIONAL SUBMITTALS

- A. As-Built Data:** Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

- B. Field quality-control reports.**

1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.**

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:** Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.
- C. Comply with TIA-607-B.

2.02 CONDUCTORS

- A. Comply with UL 486A-486B.
- B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
 - 1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
 - 2. Cable Tray Equipment Grounding Wire: No. 6 AWG.
- C. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B3.
 - 2. Stranded Conductors: ASTM B8.
 - 3. Tinned Conductors: ASTM B33.
 - 4. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.03 CONNECTORS

- A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.
- B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
 - 1. Electroplated tinned copper, C and H shaped.
- C. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.
- D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.04 GROUNDING BUSBARS

- A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.
 - 1. Predrilling shall be with holes for use with lugs specified in this Section.
 - 2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
 - 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
- B. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.
 - 1. Predrilling shall be with holes for use with lugs specified in this Section.
 - 2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
 - 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
- C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.
 - 1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
 - 2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
 - 3. Rack-Mounted Vertical Busbar: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.05 GROUND RODS

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

2.06 IDENTIFICATION

- A. Comply with requirements for identification products in Section 270553 "Identification for Communications Systems."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.
- B. Inspect the test results of the ac grounding system measured at the point of BCT connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.
- B. Comply with NECA 1.
- C. Comply with TIA-607-B.

3.03 APPLICATION

- A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
 - 1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
 - 2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
- B. Underground Grounding Conductors: Install barecopper conductor, No. 2 AWG minimum.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.
- D. Conductor Support:
 - 1. Secure grounding and bonding conductors at intervals of not less than 36 inches.
- E. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.
 - a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.04 GROUNDING ELECTRODE SYSTEM

- A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 1/0 AWG.

3.05 GROUNDING BUSBARS

- A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches minimum from wall, 12 inches above finished floor unless otherwise indicated.
- B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.06 CONNECTIONS

- A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.
- B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
- C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
 1. Use crimping tool and the die specific to the connector.
 2. Pretwist the conductor.
 3. Apply an antioxidant compound to all bolted and compression connections.
- D. Primary Protector: Bond to the TMGB with insulated bonding conductor.
- E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.

- F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.
- G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.
- H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.
- I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted-pair cables.
- J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.
- K. Access Floors: Bond all metal parts of access floors to the TGB.

3.07 IDENTIFICATION

- A. Labels shall be preprinted or computer-printed type.
 - 1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
 - 2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
 - 3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.08 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

- a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.
- 3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.
 - a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.
- C. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.
- D. Grounding system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION

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SECTION 27 05 28

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Metallic surface pathways.
7. Nonmetallic surface pathways.
8. Hooks.
9. Boxes, enclosures, and cabinets.
10. Polymer-concrete handholes and boxes for exterior underground cabling.

1.02 ACTION SUBMITTALS

A. Product data for each type of product.

- ###### B. Shop Drawings: For custom enclosures and cabinets and custom underground handholes and boxes. Include plans, elevations, sections, and attachment details.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

- ###### B. Seismic Qualification Data: Seismic rating for all pathway racks, enclosures, cabinets, equipment racks, and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

- ###### B. 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. AFC Cable Systems; Atkore International.
2. Allied Tube & Conduit; Atkore International.
3. Southwire Company.

C. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-D.

D. GRC: Comply with ANSI C80.1 and UL 6.

E. ARC: Comply with ANSI C80.5 and UL 6A.

F. IMC: Comply with ANSI C80.6 and UL 1242.

G. PVC-Coated Steel Conduit: PVC-coated GRC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

H. EMT: Comply with ANSI C80.3 and UL 797.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS AND FITTINGS

A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.

B. 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. Allied Tube & Conduit; Atkore International.
2. Anaconda Sealtite; Anamet Electrical, Inc.
3. Electri-Flex Company.

- C. General Requirements for Nonmetallic Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 - 2. Comply with TIA-569-D.
- D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. Rigid HDPE: Comply with UL 651A.
- F. Continuous HDPE: Comply with UL 651A.
- G. RTRC: Comply with UL 2515A and NEMA TC 14.
 - 1. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.
- H. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal trough of rectangular cross section fabricated to required size and shape, without holes or knockouts, and with hinged or removable covers.
- B. 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. B-line; Eaton, Electrical Sector.
 - 2. MonoSystems, Inc.
 - 3. Square D; Schneider Electric USA.
- C. General Requirements for Metal Wireways and Auxiliary Gutters:
 - 1. Comply with UL 870 and NEMA 250, Type 1, Type 3R, Type 4 unless otherwise indicated, and sized according to NFPA 70.
 - 2. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 - 3. Comply with TIA-569-D.
- D. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.04 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

- C. 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. ABB, Electrification Products Division.
 - 2. Hoffman; nVent.
 - 3. Niedax Inc.
- D. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:
 - 1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 - 2. Comply with TIA-569-D.
- E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- F. Solvents and Adhesives: As recommended by conduit manufacturer.

2.05 SURFACE METAL PATHWAYS

- A. Description: Galvanized steel with snap-on covers, complying with UL 5.
- B. 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. MonoSystems, Inc.
 - 2. Panduit Corp.
 - 3. Wiremold; Legrand North America, LLC.
- C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with TIA-569-D.

2.06 SURFACE NONMETALLIC PATHWAYS:

- A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Products Division.
 - 2. MonoSystems, Inc.
 - 3. Wiremold; Legrand North America, LLC.
- C. Finish: Texture and color selected by Architect from manufacturer's standard colors.

- D. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- E. Comply with TIA-569-D.

2.07 HOOKS

- A. Description: Prefabricated sheet metal cable supports for telecommunications cable.
- B. 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. MonoSystems, Inc.
 - 2. Panduit Corp.
 - 3. Wiremold; Legrand North America, LLC.
- C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with TIA-569-D.
- E. Galvanized steel.
- F. J shape.

2.08 BOXES, ENCLOSURES, AND CABINETS

- A. Description: Enclosures for communications.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Products Division.
 - 2. MonoSystems, Inc.
 - 3. Wiremold; Legrand North America, LLC.
- C. General Requirements for Boxes, Enclosures, and Cabinets:
 - 1. Comply with TIA-569-D.
 - 2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
 - 3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
 - 4. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- D. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- E. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- F. Metal Floor Boxes:

1. Material: sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

J. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

K. Cabinets:

1. NEMA 250, Type 1 Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.09 POLYMER-CONCRETE HANDHOLES

A. Description: Molded of sand and aggregate; bound together with polymer resin; and reinforced with steel, fiberglass, or a combination of the two.

B. 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. Armorcast Products Company.
2. Oldcastle Infrastructure Inc.; CRH Americas.
3. Quazite; Hubbell Incorporated, Power Systems.

C. General Requirements for Polymer Concrete Handholes:

1. Boxes and handholes for use in underground systems shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
3. Comply with TIA-569-D.

D. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.

- E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 - 1. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - 2. Cover Legend: Molded lettering, "COMMUNICATIONS".

PART 3 - EXECUTION

3.01 PATHWAY APPLICATION

- A. Minimum Pathway Size: 3/4-inch trade size for copper and aluminum cables, and 1 inch for optical-fiber cables.
- B. Pathway Fittings: Compatible with pathways and suitable for use and location.
- C. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- D. Install surface pathways only where indicated on Drawings.
- E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.02 INSTALLATION

- A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA/BICSI 568.
 - 3. TIA-569-D.
 - 4. NECA 101
 - 5. NECA 105.
- B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- C. Comply with requirements in Section 078400 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- D. Comply with requirements in Section 270529 "Hangers and Supports for Communications Systems" for hangers and supports.
- E. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling" for sleeves and sleeve seals for communications.
- F. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- G. Complete pathway installation before starting conductor installation.

- H. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.
- I. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- J. Support conduit within 12 inches of enclosures to which attached.
- K. Pathways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
 - 3. Arrange pathways to keep a minimum of 1 inch of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from nonmetallic conduit and fittings to RNC, Type EPC-40-PVC, and fittings before rising above floor.
- L. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for pathways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
- N. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.
- P. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.
- R. Surface Pathways:
 - 1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
 - 2. Install surface pathway with a minimum 2-inch radius control at bend points.
 - 3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section.

Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

- S. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
 - 1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
 - 2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
 - 3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- T. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.
- U. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service pathway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
- W. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC that is located where environmental temperature change may exceed 100 deg F, and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

X. Hooks:

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
3. Hook spacing shall allow no more than 6 inches of slack. The lowest point of the cables shall be no less than 6 inches adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet o.c.
5. Provide a hook at each change in direction.

Y. Mount boxes at heights indicated on Drawings. Install boxes with height measured to center of box unless otherwise indicated.

Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

AA. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Install backfill.
2. After installing conduit, backfill and compact.
3. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete around conduit for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 270553 "Identification for Communications Systems."

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.06 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078400 "Penetration Firestopping."

3.07 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage or deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

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SECTION 27 05 29

HANGERS AND SUPPORTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel slotted support systems for communication raceways.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for communications hangers and support systems.

1. Trapeze hangers. Include product data for components.
2. Steel slotted-channel systems.
3. Aluminum slotted-channel systems.
4. Nonmetallic slotted-channel systems.
5. Equipment supports.
6. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
7. Include design calculations for seismic restraints.

1.03 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, shown and coordinated with each other, using input from installers of the items involved.

B. Seismic Qualification Data: Certificates, for hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.04 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 2. Component Importance Factor: 1.5.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame Rating: Class 1.
 2. Self-extinguishing according to ASTM D635.

2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles, with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 2. Material for Channel, Fittings, and Accessories: Galvanized steel, Stainless Steel Type 304, Stainless Steel Type 316.
 3. Channel Width: 1-5/8 inches.
 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 8. Channel Dimensions: Selected for applicable load criteria.

- B. Conduit and Cable Support Devices: Steel clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.03 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA/BICSI 568.
 - 3. TIA-569-C.

4. NECA 101.
 5. NECA 105.
- B. Comply with requirements in Section 078400 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

- A. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, according to NFPA 70.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Use expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated-driven threaded studs, provided with lock washers and nuts, may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes,

transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

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SECTION 27 05 36

CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Ladder cable tray.
 - 2. Cable tray accessories.
 - 3. Warning signs.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of cable tray.
 - 1. Include data indicating dimensions and finishes for each type of cable tray indicated.
- B. Shop Drawings: For each type of cable tray.
 - 1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
 - 2. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
 - a. Vertical and horizontal offsets and transitions.
 - b. Clearances for access above and to sides of cable trays.
 - c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
 - d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.
- C. Delegated-Design Submittal: For seismic restraints.
 - 1. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.
 - 2. Design Calculations: Calculate requirements for selecting seismic restraints.
 - 3. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
 - 2. Vertical and horizontal offsets and transitions.
 - 3. Clearances for access above and to side of cable trays.
 - 4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.
- B. Seismic Qualification Data: Certificates, for cable trays, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cable tray supports and seismic bracing.
- B. Seismic Performance: Cable trays and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the cable trays will remain in place without separation of any parts when subjected to the seismic forces specified."
 - 2. Component Importance Factor: 1.5.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes in cable tray installed outdoors.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 GENERAL REQUIREMENTS FOR CABLE TRAYS

- A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.
 - 1. Source Limitations: Obtain cable trays and components from single manufacturer.
- B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

- C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:
1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
 2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
 3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.03 LADDER CABLE TRAY

- 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. [ABB Electrification Installations Products.](#)
2. [Atkore Cope.](#)
3. [Chalfant Manufacturing Company.](#)

- B. Description:

1. Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
2. Width: 12 inches unless otherwise indicated on Drawings.
3. Minimum Usable Load Depth: 4 inches.
4. Straight Section Lengths: 10 feet, except where shorter lengths are required to facilitate tray assembly.
5. Rung Spacing: 6 inches o.c.
6. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
7. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
8. No portion of the rungs shall protrude below the bottom plane of side rails.
9. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
10. Fitting Minimum Radius: 12 inches.
11. Class Designation: Comply with NEMA VE 1, Class 5AA.
12. Splicing Assemblies: Bolted type using serrated flange locknuts.
13. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

- C. Materials and Finishes:

1. Steel:
 - a. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A1011/A1011M, SS, Grade 33.
 - b. Steel Tray Splice Plates: ASTM A1011/A1011M, HSLAS, Grade 50, Class 1.
 - c. Fasteners: Steel complies with the minimum mechanical properties of ASTM A510/A510M, Grade 1008.
 - d. Finish: Hot-dip galvanized after fabrication, complying with ASTM A123/A123M, Class B2.
- 1) Hardware: Galvanized, ASTM B633.

- e. Finish: Hot-dip galvanized after fabrication, complying with ASTM A653/A653M, G90.
 - 1) Hardware: Galvanized, ASTM B633.
 - f. Finish: Electrogalvanized after fabrication, complying with ASTM B633.
 - 1) Hardware: Galvanized, ASTM B633.
 - g. Finish: Epoxy-resin paint.
 - 1) Powder-Coat Enamel: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.
 - 2) Epoxy-Resin Prime Coat: Cold-curing epoxy primer, MPI# 101.
 - 3) Epoxy-Resin Topcoat: Epoxy, cold-cured gloss, MPI# 77.
 - 4) Hardware: Chromium-zinc plated, ASTM F1136.
 - h. Finish: Factory-standard primer, ready for field painting, with chromium-zinc-plated hardware according to ASTM F1136.
 - i. Finish: Black oxide finish for support accessories and miscellaneous hardware according to ASTM D769.
 - j. .
2. Aluminum:
- a. Materials: Alloy 6063-T6 according to ANSI H35.1/H 35.1M for extruded components, and Alloy 5052-H32 according to ANSI H35.1/H 35.1M for fabricated parts.
 - b. Hardware: Chromium-zinc-plated steel, ASTM F1136.
 - c. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F593 and ASTM F594.
3. Stainless Steel:
- a. Materials: Low-carbon, passivated stainless steel, Type 304L, ASTM F593 and ASTM F594.
 - b. Hardware for Stainless-Steel Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F593 and ASTM F594.

2.04 CABLE TRAY ACCESSORIES

- A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.
- B. Barrier Strips: Same materials and finishes as for cable tray.
- C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.05 WARNING SIGNS

- A. Comply with requirements for identification in Section 270553 "Identification for Communications Systems."

- B. Lettering: 1-1/2-inch- high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

2.06 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect cable trays according to NEMA FG 1.

PART 3 - EXECUTION

3.01 CABLE TRAY INSTALLATION

- A. Install cable trays according to NEMA FG 1.
- B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.
- C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.
- D. Remove burrs and sharp edges from cable trays.
- E. Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.
- F. Fasten cable tray supports to building structure and install seismic restraints.
- G. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb. Comply with requirements in Section 270529 "Hangers and Supports for Communications Systems." Comply with seismic-restraint details according to Section 270548.16 "Seismic Controls for Communications Systems."
- H. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.
- I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
- J. Support bus assembly to prevent twisting from eccentric loading.
- K. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.
- L. Locate and install supports according to NEMA FG 1. Do not install more than one cable tray splice between supports.
- M. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

- N. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA FG 1. Space connectors and set gaps according to applicable standard.
- O. Make changes in direction and elevation using manufacturer's recommended fittings.
- P. Make cable tray connections using manufacturer's recommended fittings.
- Q. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."
- R. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.
- S. Install cable trays with enough workspace to permit access for installing cables.
- T. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.
- U. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.
- V. Clamp covers on cable trays installed outdoors with heavy-duty clamps.
- W. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.02 CABLE TRAY GROUNDING

- A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems."
- B. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.
- C. Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch intervals. The grounding conductor shall be sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."
- D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.
- E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.03 CABLE INSTALLATION

- A. Install cables only when each cable tray run has been completed and inspected.

- B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.
- C. Fasten cables on vertical runs to cable trays every 18 inches.
- D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.
- E. Tie MI cables down every 36 inches where required to provide a 2-hour fire rating and every 72 inches elsewhere.
- F. In existing construction, remove inactive or dead cables from cable trays.

3.04 CONNECTIONS

- A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.
- B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.05 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
 2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
 3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
 4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
 5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
 6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorquer in suspect areas.
 7. Check for improperly sized or installed bonding jumpers.
 8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
 9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.
- B. Prepare test and inspection reports.

3.06 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION

SECTION 27 05 43

UNDERGROUND PATHWAYS AND STRUCTURES FOR COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal conduit and fittings, including GRC and PVC-coated GRC.
 - 2. Rigid nonmetallic duct.
 - 3. Duct accessories, including rigid innerduct and fabric innerduct.
 - 4. Precast concrete handholes.
 - 5. Polymer concrete handholes and boxes with polymer concrete cover.

1.03 DEFINITIONS

- A. Direct-Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials, such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. Duct Bank:
 - 1. Two or more ducts installed in parallel, with or without additional casing materials.
 - 2. Multiple duct banks.
- D. GRC: Galvanized rigid conduit.
- E. IMC: Intermediate metal conduit.
- F. RNC: Rigid nonmetallic conduit.
- G. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include duct-bank materials, including spacers and miscellaneous components.
 - 2. Include duct and conduits and their accessories, including elbows, end bells, bends, fittings, duct spacers and solvent cement.
 - 3. Include accessories for manholes, handholes, and boxes, and other utility structures.

4. Include underground-line warning tape.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

- a. Include plans, elevations, sections, details, attachments to other work, and accessories.
- b. Include duct entry provisions, including location and duct size.
- c. Include reinforcement details.
- d. Include grounding details.
- e. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

- a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
- b. Include duct entry provisions, including location and duct size.
- c. Include cover design.
- d. Include grounding details.
- e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.05 INFORMATIONAL SUBMITTALS

A. Duct and Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.06 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

1.08 FIELD CONDITIONS

- A. Interruption of Existing Communications Service: Do not interrupt communications service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary communications service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of communications service.
 - 2. Do not proceed with interruption of communications service without Construction Manager's written permission.
- B. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

- A. GRC: Comply with ANSI C80.1 and UL 6.
- B. PVC-Coated Steel Conduit: PVC-coated GRC.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch, minimum.
- C. General Requirements for Metal Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
 - 2. Comply with TIA-569-C and TIA-758-C.

2.02 RIGID NONMETALLIC DUCTS

- A. Underground Plastic Utilities Duct: Type EPC-80-PVC and Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Underground Plastic Utilities Duct: Type EB-20 PVC RNC, complying with NEMA TC 6 & 8, ASTM F512, and UL 651, with matching fittings complying with NEMA TC 9 by same manufacturer as duct.
- C. General Requirements for Nonmetallic Ducts and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
 - 2. Comply with TIA-569-C and TIA-758-C.
- D. Solvents and Adhesives: As recommended by duct manufacturer.

2.03 FLEXIBLE NONMETALLIC DUCTS

- A. HDPE Duct: Type EPEC 40-HDPE complying with NEMA TC 7 and UL 651A.
 - 1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
 - 2. Comply with TIA-569-C and TIA-758-C.

2.04 DUCT ACCESSORIES

- A. Rigid Innerduct: Smooth HDPE duct, orange in color, designed for installation within a duct or pathway.
- B. Fabric Innerduct: Continuous, polyester, single -pocket fabric innerduct, with internal pull tape and tracer wire.
- C. Duct Spacers: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
 - 1.
- D. Underground-Line Warning Tape: Underground-line warning tape specified in Section 270553 "Identification for Communications Systems."

2.05 PRECAST CONCRETE HANDHOLES AND BOXES

- A. Description: Monolithically poured, factory-fabricated, reinforced-concrete walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
- B. Comply with ASTM C858 for design and manufacturing processes.
- C. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
- D. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- E. Cover Legend: Molded lettering, " COMM."
- F. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- G. Extensions and Slabs: Designed to mate with bottom of enclosure, and made of same material as enclosure.
 - 1. Extension shall provide increased depth of 12 inches.
 - 2. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
- H. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

- I. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct and duct banks, plus an additional 6 inches vertically and horizontally to accommodate alignment variations.
 - 1. Knockout panels shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
 - 2. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
 - 3. Knockout panel openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
 - 4. Knockout panels shall be 1-1/2 to 2 inches thick.
- J. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - 1. Type and size shall match fittings to duct or conduit to be terminated.
 - 2. Fittings shall align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.
- K. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.06 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

- A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
- B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- C. Color: Gray.
- D. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- G. Cover Legend: Molded lettering, "COMM."
- H. all.
- I. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
- J. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.07 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C1037.
- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 - 1. Tests of materials shall be performed by an independent testing agency.
 - 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 - 3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.
- C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.02 UNDERGROUND DUCT APPLICATION

- A. Duct for Communications: Type EPC-40-PVC RNC, in concrete-encased duct bank unless otherwise indicated.
- B. Duct for Communications: Type EPEC-40-HDPE duct in direct-bored duct bank unless otherwise indicated.
- C. Underground Duct Crossing Paved Paths and Driveways: Type EPC-40-PVC RNC, encased in reinforced concrete.
- D. Stub-Ups for Communications: Concrete-encased PVC-coated GRC.

3.03 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for Communications:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete, AASHTO HB 17, H-10 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-5 or Polymer concrete units, SCTE 77, Tier 8 structural load rating.
4. Cover design load shall not exceed the design load of the handhole or box.

3.04 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Replace area immediately after backfilling is completed or after construction in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."
- E. Cut and patch existing pavement in the path of underground duct, duct bank, and utility structures according to the "Cutting and Patching" Article in Section 017300 "Execution."

3.05 DUCT AND DUCT-BANK INSTALLATION

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct and duct bank according to NEMA TCB 2 and TIA-758-C.
- C. Slope: Pitch duct and duct bank a minimum slope of 1:100 down toward manholes and handholes and away from buildings and equipment. Slope duct and duct bank from a high point in runs between two manholes, to drain in both directions.
- D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.
 1. Duct and duct banks shall have maximum of two 90-degree bends, or the total of all bends shall be no more 180 degrees between pull points.
- E. Joints: Use solvent-cemented joints in duct and fittings, and make watertight according to manufacturer's written instructions. Stagger couplings, so those of adjacent ducts do not lie in same plane.
- F. Installation Adjacent to High-Temperature Steam Lines: Where duct or duct banks are installed parallel to underground steam lines, perform calculations showing the duct or duct bank will not

be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40

- G. deg C, and anywhere the duct or duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- H. End-Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 6 inches o.c. for 4-inch duct, and vary proportionately for other duct sizes.
 - 1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct slope and without forming a trap in the line.
 - 2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight-line direct-buried duct and duct banks, with calculated expansion of more than 3/4 inch.
 - 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- I. Terminator Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches o.c. for 4-inch duct, and vary proportionately for other duct sizes.
 - 1. Begin change from regular spacing to terminator spacing 10 feet from the terminator without reducing duct slope and without forming a trap in the line.
 - 2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight-line duct or duct bank, with calculated expansion of more than 3/4 inch.
- J. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet outside the building wall, without reducing duct slope away from the building or forming a trap in the duct. Use fittings manufactured for RNC duct-to-GRC conduit transition. Install GRC penetrations of building walls as specified in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."
- K. Sealing: Provide temporary closure at terminations of duct that has cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- L. Innerduct: Install immediately after mandreling duct. Size and type as indicated on Drawings.
- M. Pulling Cord: Install 200-lbf- test nylon cord in empty duct and innerduct.
- N. Concrete-Encased Duct and Duct Bank:
 - 1. Excavate trench bottom to provide firm and uniform support for duct or duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.
 - 2. Width: Excavate trench 3 inches wider than duct or duct bank on each side.
 - 3. Depth: Install top of duct and duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
 - 4. Support duct and duct bank on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.

5. Minimum Space Between Duct: 3 inches between edge of duct and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and communications ducts.
6. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet of duct. Place spacers within 24 inches of duct ends. Stagger spacers approximately 6 inches between tiers. Secure spacers to earth and duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around duct or duct bank.
7. Elbows: Use manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct run unless otherwise indicated. Extend concrete encasement throughout length of elbow.
8. Reinforcement: Reinforce concrete-encased duct and duct bank where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
9. Forms: Use trench walls to form side walls of duct and duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
10. Concrete Cover: Install a minimum of 3 inches of concrete cover between edge of duct to exterior envelope wall, 2 inches between ducts, and 4 inches between power and communications duct.
11. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of duct as its temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
 - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.
12. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between ducts and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto duct. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
13. ss specifically designed for duct-bank application.

O. Direct-Buried Duct and Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct and duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for duct less than 6 inches in nominal diameter.
2. Install duct with a minimum of 3 inches between duct for like services and 6 inches between power and signal duct.
3. Width: Excavate trench 3 inches wider than duct or duct bank on each side.
4. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet of duct. Place spacers within 24 inches of duct ends. Stagger spacers approximately 6 inches between tiers. Secure spacers to earth and duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around duct or duct bank.

5. Elbows: Install manufactured duct elbows for stub-ups, at building entrances through floor, and at changes of direction in duct unless otherwise indicated. Encase elbows for stub-ups throughout length of elbow..
 6. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.
 - a. Couple GRC to duct with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. For equipment mounted on outdoor bases, extend GRC horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
 7. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving duct at end of run free to move with expansion and contraction, as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over duct and hand tamp. Firmly tamp backfill around duct to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.
 - a. Place minimum of 3 inches of sand as a bed for duct and duct bank. Place sand to a minimum of 6 inches above top level of duct and duct bank.
- P. Underground-Line Warning Tape: Bury nonconducting underground-line warning tape specified in Section 270553 "Identification for Communication Systems" no less than 12 inches above all concrete-encased duct and duct bank and approximately 12 inches below grade. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.06 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

- A. Cast-in-Place Manhole Installation:
1. Finish interior surfaces with a smooth-troweled finish.
 2. Knockouts for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inches thick, arranged as indicated.
 3. Comply with requirements in Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.
- B. Precast Concrete Handhole and Manhole Installation:
1. Comply with ASTM C891 unless otherwise indicated.
 2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
 3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

- D. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

3.07 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct and duct bank, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
- D. Install handholes and boxes with bottom below frost line, below grade.
- E. working clearances in enclosure.
- F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring, encircling, and in contact with, enclosure, and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
 - 1. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
 - 2. Dimensions: .

3.08 GROUNDING

- A. Ground underground duct, duct bank, and utility structures according to Section 270526 "Grounding and Bonding for Communications Systems."

3.09 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch- long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
 - 3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 270526 "Grounding and Bonding for Communications Systems."

- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.010 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris.
- B. Clean internal surfaces of manholes, including sump.
 - 1. Sweep floor, removing dirt and debris.
 - 2. Remove foreign material.

END OF SECTION 270543

END OF SECTION

SECTION 27 05 44

SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Round sleeves.
 - 2. Rectangular sleeves.
 - 3. Sleeve seal systems.
 - 4. Grout.
 - 5. Pourable sealants.
 - 6. Foam sealants.

1.03 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.01 ROUND SLEEVES

- A. Wall Sleeves, Steel:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Advance Products & Systems, LLC.
 - b. Flexicraft Industries.
 - c. GPT; an EnPro Industries company.
 - 2. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.
- B. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Benefast.
 - b. Specified Technologies, Inc.
2. Description: Galvanized-steel sheet; thickness not less than 0.0239-inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.02 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Abesco Fire LLC.
 - b. Specified Technologies, Inc.
 - c. Wiremold; Legrand North America, LLC.
2. Description:
 - a. Material: Galvanized sheet steel.
 - b. Minimum Metal Thickness:
 - 1) For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness must be 0.052 inch.
 - 2) For sleeve cross-section rectangle perimeter not less than 50 inches or with one or more sides larger than 16 inches, thickness must be 0.138 inch.

2.03 SLEEVE SEAL SYSTEMS

- 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. Advance Products & Systems, Inc.
 2. Pipeline Seal and Insulator, Inc.
 3. Proco Products, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable or between pathway and cable.
 1. Pressure Plates: Carbon steel.
 2. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.04 GROUT

- 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. W.R. Meadows, Inc.
- B. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
 - 1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.05 POURABLE SEALANTS

- 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. Carlisle SynTec Incorporated.
 - 2. GAF.
 - 3. Johns Manville; a Berkshire Hathaway company.
- B. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.06 FOAM SEALANTS

- 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. Dow Chemical Company (The).
 - 2. Innovative Chemical Products (Building Solutions Group).
- B. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.01 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

- a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
- b. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable, unless sleeve seal system is to be installed or seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations:

1. Install steel pipe sleeves with integral waterstops. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve seal system. Install sleeve during construction of floor or wall.
2. Install steel pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

3.02 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.
- B. Install conduits and cable with no crossings within the sleeve.
- C. Fill opening around conduits and cables with expanding foam without leaving voids.

- D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.03 INSTALLATION OF SLEEVE SEAL SYSTEMS

- A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

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SECTION 27 05 48

VIBRATION AND SEISMIC CONTROLS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Restraints - rigid type.
3. Restraints - cable type.
4. Restraint accessories.
5. Post-installed concrete anchors.
6. Concrete inserts.

B. Related Requirements:

1. Section 270529 "Hangers and Supports for Communications Systems" for commonly used communications system supports and installation requirements.

1.03 DEFINITIONS

- A. Designated Seismic System: A communications system component that requires design in accordance with ASCE/SEI 7, Ch. 13 and for which the Component Importance Factor is greater than 1.0.
- B. OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load capacity for each seismic-restraint device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
3. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by UL product listing or an agency acceptable to authorities having jurisdiction.
4. Annotate to indicate application of each product submitted and compliance with requirements.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittal for Each Seismic-Restraint Device:

1. For each seismic-restraint device, including restraint - rigid and cable type, restraint accessory, and concrete anchor and insert that is required by this Section or is indicated on Drawings, submit the following:
 - a. Seismic Restraints: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
 - b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
 - c. Seismic Design Calculations: Submit all input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.
 - d. Qualified Professional Engineer: All designated design submittals for seismic calculations are to be signed and sealed by the qualified professional engineer responsible for their preparation.
2. Product Listing, Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
3. All delegated design submittals for seismic-restraint detail drawings are to be signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for communications components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Welding certificates.
- C. Field quality-control reports.
- D. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in ASCE/SEI 7-05, Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.
 1. Provide equipment manufacturer's written certification for each designated active communications seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7, including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction.
 2. Provide equipment manufacturer's written certification that components with hazardous contents maintain containment following the design earthquake by methods required in ASCE/SEI 7-05.

3. Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by a licensed professional engineer.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent agency must have experience and capability to conduct testing indicated, be and NRTL as defined by OSHA in 29 CFR 1910.7, and be acceptable to authorities having jurisdiction.
- B. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: an agency acceptable to authorities having jurisdiction.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic control system.
 1. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7-05.
- B. Consequential Damage: Provide additional seismicrestraints for suspended communications components or anchorage of floor-, roof-, or wall-mounted communications components as indicated in ASCE/SEI 7-05 so that failure of a non-essential or essential communications component will not cause failure of any other essential architectural, mechanical, or communications building component.
- C. Fire/Smoke Resistance: Seismic-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.
- D. Component Supports:
 1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.
 2. All component support attachments must comply with force and displacement resistance requirements of ASCE/SEI 7-05 Section 13.6.

2.02 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads: .

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Ace Mountings Co., Inc.
 - b. CADDY; brand of nVent Electrical plc.
 - c. California Dynamics Corporation.
2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
5. Surface Pattern: Smooth, ribbed, or waffle pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.
8. Sandwich-Core Material: Resilient.
 - a. Surface Pattern: Smooth, ribbed, or waffle pattern.
 - b. Infused nonwoven cotton or synthetic fibers.

2.03 RESTRAINTS - RIGID TYPE

- 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. Atkore Unistrut.
 2. CADDY; brand of nVent Electrical plc.
 3. California Dynamics Corporation.
- B. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.04 RESTRAINTS - CABLE TYPE

- 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. CADDY; brand of nVent Electrical plc.
 2. Cooper B-line; brand of Eaton, Electrical Sector.
 3. Gripple Inc.
- B. Seismic-Restraint Cables: ASTM A1023 galvanized or ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.
- C. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.05 RESTRAINT ACCESSORIES

- 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. Atkore Unistrut.
 2. CADDY; brand of nVent Electrical plc.
 3. Cooper B-line; brand of Eaton, Electrical Sector.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings] and restraint cables.
- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.06 POST-INSTALLED CONCRETE ANCHORS

- A. Mechanical Anchor Bolts:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Atkore Unistrut.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. Hilti, Inc.
 2. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.
- B. Adhesive Anchor Bolts:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Atkore Unistrut.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. Hilti, Inc.
 2. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for

exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

- C. Provide post-installed concrete anchors which have been prequalified for use in seismic applications. Post-installed concrete anchors must conform to all requirements of ASCE/SEI 7-05, Ch. 13.
 - 1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 - 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- D. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp that is not vibration isolated.
 - 1. Undercut expansion anchors are permitted.

2.07 CONCRETE INSERTS

- 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. Atkore Unistrut.
 - 2. Cooper B-line; brand of Eaton, Electrical Sector.
 - 3. Hilti, Inc.
- B. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC466 testing.
- C. Comply with MSS SP-58.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and equipment to receive seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static and seismic loads within specified loading limits.

3.03 INSTALLATION OF SEISMIC RESTRAINT DEVICES

- A. Provide seismic restraint devices for systems and equipment where indicated in Equipment Schedules or Communications Seismic and Wind-Load Controls Schedule, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.
 - 1. Install all equipment and devices to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7-05.
- B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- C. Installation of seismic restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.
- D. Equipment Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Raceway, Cable, Wireway, Cable Tray, and Busway Support and Hanger Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
 - 3. Comply with requirements in NFPA 70 and ASCE/SEI 7-05.
- F. Equipment and Hanger Restraints:
 - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- G. Install cables so they do not bend across edges of adjacent equipment or building structure.
- H. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

J. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
1. Perform tests and inspections.
 2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
 4. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 5. Test no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
 6. Test to 90 percent of rated proof load of device.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Seismic controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION

SECTION 27 05 53

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Underground-line warning tape.
2. Bands and tubes.
3. Cable ties.
4. Miscellaneous identification products.
5. Labels.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Comply with NFPA 70 and TIA 606-B.
- B. Comply with ANSI Z535.4 for safety signs and labels.
- C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.

2.03 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Panduit Corp.
 - c. Seton Identification Products; a Brady Corporation company.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Panduit Corp.
 - c. Seton Identification Products; a Brady Corporation company.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, vinyl flexible labels with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements,,:
 - a. Brady Corporation.
 - b. Panduit Corp.
 - c. Seton Identification Products; a Brady Corporation company.
2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
3. Marker for Labels:
 - a. Permanent, waterproof black ink marker recommended by tag manufacturer.
 - b. Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Brother International Corporation.
 - c. Ideal Industries, Inc.
 - d. Panduit Corp.
2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches for raceway and conductors.
 - b. 3-1/2 by 5 inches for equipment.
 - c. As required by authorities having jurisdiction.

2.04 SIGNS

A. Baked-Enamel Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlton Industries, LP.
 - b. emedco.
 - c. Marking Services, Inc.
2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches.

B. Laminated-Acrylic or Melamine-Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. emedco.
 - c. Marking Services, Inc.
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. in., 1/8 inch thick.
 - c. Engraved legend with black letters on white face.
 - d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.05 CABLE TIES

- 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. HellermannTyton.
 - 2. Marking Services, Inc.
 - 3. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F according to ASTM D638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F according to ASTM D638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F according to ASTM D638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.06 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Verify identity of each item before installing identification products.

- C. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- D. Apply identification devices to surfaces that require finish after completing finish work.
- E. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.
- F. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- G. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
 - 3. Provide label 6 inches from cable end.
- H. Snap-Around Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Provide label 6 inches from cable end.
- I. Self-Adhesive Wraparound Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Provide label 6 inches from cable end.
- J. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
- K. Cable Ties: General purpose, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.02 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

1. System legends shall be as follows:
 - a. Telecommunications.
- D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, composed of the following, in the order listed:
 1. Wiring closet designation.
 2. Colon.
 3. Faceplate number.
- E. Equipment Room Labeling:
 1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
 2. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
 3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:
 - a. Room number being served.
 - b. Colon.
 - c. Faceplate number.
- F. Backbone Cables: Label each cable with a self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.
- G. Horizontal Cables: Label each cable with a self-adhesive wraparound label indicating the following, in the order listed:
 1. Room number.
 2. Colon.
 3. Faceplate number.
- H. Instructional Signs: Self-adhesive labels.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Baked-enamel warning signs.
 1. Apply to exterior of door, cover, or other access.
- J. Equipment Identification Labels:
 1. Indoor Equipment: Laminated-acrylic or melamine-plastic sign.
 2. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign.
 3. Equipment to Be Labeled:
 - a. Communications cabinets.
 - b. Uninterruptible power supplies.
 - c. Computer room air conditioners.
 - d. Fire-alarm and suppression equipment.
 - e. Egress points.

- f. Power distribution components.

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SECTION 27 15 13

COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Category 6 twisted pair cable.
2. Twisted pair cable hardware, including plugs and jacks.
3. Cable management system.
4. Grounding provisions for twisted pair cable.

1.02 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration Drawings and printouts.

- 4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment.
 - C. Twisted pair cable testing plan.
 - D. Sustainable Design Submittals:
 - E. Samples: For telecommunications jacks and plugs, in specified finish, one for each type and configuration and faceplates for color selection and evaluation of technical features.
- 1.04 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.
 - B. Product Certificates: For each type of product.
 - C. Source quality-control reports.
 - D. Field quality-control reports.
- 1.05 CLOSEOUT SUBMITTALS
- A. Maintenance data.
 - B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB media.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.
- 1.06 QUALITY ASSURANCE
- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
 - B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.07 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.08 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, provide software support for two years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-B.

2.02 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
 - 1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed cable routing assembly.
 - 2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - 3. Communications, Non-plenum: Type CMR complying with UL 1666 and ICEA S-103-701.
 - 4. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
 - 5. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.
- C. RoHS compliant.

2.03 CATEGORY 6 TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.
- B. 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. Belden.
 2. Berk-Tek Leviton; a Nexans/Leviton alliance.
 3. CommScope, Inc.
 4. Mohawk; a division of Belden Networking, Inc.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100-ohm, 23 AWG solid copper.
- E. Shielding/Screening: Shielded twisted pairs (FTP).
- F. Cable Rating: Plenum.
- G. Jacket: White or Blue thermoplastic.
1. Refer to department specific IT policy for coloring requirements. RFI shall be submitted at bid time or after award to confirm coloring requirements.

2.04 TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. 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. Belden.
 2. Berk-Tek Leviton; a Nexans/Leviton alliance.
 3. CommScope, Inc.
 4. Mohawk; a division of Belden Networking, Inc.
- C. General Requirements for Twisted Pair Cable Hardware:
1. Comply with the performance requirements of Category 6.
 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 3. Cables shall be terminated with connecting hardware of same category or higher.

- D. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, from single source.
- E. Connecting Blocks:
 - 1. 110-style IDC for Category 6.
 - 2. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- F. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- G. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
 - 1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.
 - d. 24 or 48 ports.
 - 2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
 - 3. Number of Jacks per Field: One for each four-pair cable indicated.
- H. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with an eight-position modular plug at each end.
 - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
 - 2. Patch cords shall have color-coded boots for circuit identification.
- I. Plugs and Plug Assemblies:
 - 1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 - 2. Standard: Comply with TIA-568-C.2.
 - 3. Marked to indicate transmission performance.
- J. Jacks and Jack Assemblies:
 - 1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 - 2. Designed to snap-in to a patch panel or faceplate.
 - 3. Standard: Comply with TIA-568-C.2.
 - 4. Marked to indicate transmission performance.
- K. Faceplate:
 - 1. Four port, vertical single gang faceplates designed to mount to single gang wall boxes.

2. Eight port, vertical double gang faceplates designed to mount to double gang wall boxes.
3. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
4. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
5. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.

L. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

PART 3 - EXECUTION

3.01 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.
 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.
- D. General Requirements for Cabling:
 1. Comply with TIA-568-C.1.
 2. Comply with BICSI's Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
 3. Install 110-style IDC termination hardware unless otherwise indicated.
 4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
 5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.

8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
 9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
 10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 11. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
 12. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.
- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.

3.02 FIRESTOPPING

- A. Comply with requirements in Section 078400 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BICSI's "Telecommunications Distribution Methods Manual."

3.03 GROUNDING

- A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- B. Comply with TIA-607-B and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.04 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration, including optional identification requirements of this standard.
- C. Equipment grounding conductors.
- D. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 - 4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.05 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections:
 - 1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 271513

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**SECTION 28 10 00
ACCESS CONTROL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Access control system requirements.
- B. Access control units and software.
- C. Access control point peripherals, including readers and keypads.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 08 71 00 - Door Hardware: Electrically operated door hardware, for interface with access control system.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 DEFINITIONS

- A. Access Control Cloud Services: Subscription-based hosted application utilizing Software as a Service (SaaS) delivery model in lieu of on-premises servers/software.
- B. Local Control Services: Software is managed on-premises.

1.04 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other installers to provide suitable door hardware as required for both access control functionality and code compliance.
 - 2. Coordinate the placement of readers with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 3. Coordinate the work with other installers to provide power for equipment at required locations.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Preinstallation Meetings:
 - 1. Conduct meeting with facility representative to review reader and equipment locations.
 - 2. Conduct meeting with facility representative and other related equipment manufacturers to discuss access control system interface requirements.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- E. Manufacturer's detailed field testing procedures.
- F. Field quality control test reports.
- G. Maintenance contracts.
- H. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.
- I. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
 - 1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
- J. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- K. Software: One copy of software not resident in read-only memory.
- L. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. NFPA 70.
 - 2. The requirements of the local authorities having jurisdiction.
 - 3. Applicable TIA/EIA standards.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with access control systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.
- C. Maintenance Contractor Qualifications: Same entity as installer.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.09 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Access Control Units:
 - 1. HID Signo Reader - Contactless and Keypad Readers
 - 2. HID Proximity Pro Card Readers
 - 3. Substitutions: Not permitted.
- B. Access Control Cloud Services:
 - 1. HID Global Corporation/ASSA ABLOY AB.
- C. Readers and Keypads:
 - 1. UL 294 Performance Levels

MODEL #	ACCESS CONTROL LINE SECURITY LEVEL	DESTRUCTIVE ATTACK LEVEL	ENDURANCE LEVEL	STANDBY POWER LEVEL CONDITIONS
20 / 20K / 40 / 40K	Level I	Level I	Level IV	Level I

2.02 ACCESS CONTROL SYSTEM REQUIREMENTS

- A. Provide new access control system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Connect only to a Listed Access Control / Burglary power-limited power supply. These readers are intended to be used with listed (UL294) control equipment. Suitable for outdoor use.
- C. Only Wiegand, OSDP, and Bluetooth communications have been evaluated by UL.
- D. HID Signo readers are compatible with HID Mobile Access® version 3.0.0 and later using mobile devices with BLE version 4.2 and later listed at: <https://www.hidglobal.com/mobile-access-compatible-devices>.
- E. Install in accordance with NFPA70 (NEC) Local Codes, and authorities having jurisdiction. Follow all National and Local Codes.
- F. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 1. Access Control Units and Readers: Listed and labeled as complying with UL 294.

2.03 ACCESS CONTROL UNITS AND SOFTWARE

- A. Provide access control units and software compatible with readers to be connected.
- B. Unless otherwise indicated, provide software and licenses required for fully operational system.

2.04 ACCESS CONTROL POINT PERIPHERALS

- A. Provide devices compatible with control units and software.
- B. Provide devices suitable for operation under the service conditions at the installed location.
- C. Door Locking Devices (Electric Strikes and Magnetic Locks): Comply with Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install access control system in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Provide grounding and bonding in accordance with Electrical design and Manufacturer's requirements.
- D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- E. Identify system wiring and components in accordance with Electrical design and Manufacturer's requirements.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.
- C. Prepare and start system in accordance with manufacturer's instructions.
- D. Program system parameters according to requirements of Owner.
- E. Test for proper interface with other systems.
- F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
- D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Instructor: Manufacturer's authorized representative.
 - 3. Location: At project site.

3.06 PROTECTION

- A. Protect installed system components from subsequent construction operations.

3.07 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide to Owner, a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of access control system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

END OF SECTION

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**SECTION 28 47 00
FIRE STATION ALERTING SYSTEM**

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 SECTION INCLUDES:

- A. Fire Station Alerting system equipment with an ATX Fire Station Controller along with an optional Expansion Unit installed in a central location and peripherals consisting of Room Remotes, Message Remotes and BetaBrite message signs, Sign Remotes, Gamma Signs, Room Remote 2 (RR2), Color Indicator Remote, I/O Remotes, HDTV Remotes, other Peripherals, audio amplifiers, and speakers located throughout the Fire Station.

1.03 REFERENCES

- A. Underwriter's Laboratories UL-1069.
- B. Electronics Industry Association / Telecommunications Industry Association.
- C. National Electrical Code.
- D. U.S. Dept. of Labor / Occupational Safety and Health Administration.
- E. National Fire Protection Association 1221.

1.04 QUALIFICATIONS

- A. Certified low-voltage system installer.
- B. Applicable state licenses.
- C. Certificate of successful completion of manufacturer's installation/training for the equipment being proposed.

1.05 RELATED WORK PROVIDED IN OTHER SPECIFICATION SECTIONS

- A. Unless noted otherwise, the following work is to be provided under other specification sections:

1.06 SYSTEM DESCRIPTION

- A. System hardware shall consist of a Station Alerting Controller and possible Expansion Module and multiple peripheral units.
- B. All necessary equipment required meeting the intent of these specifications, whether or not enumerated within these specifications, shall be supplied and installed to provide a complete and operating fire station alerting system.
- C. System firmware shall be the product of the station alerting system manufacturer with sole control over revisions and/or changes. Manufacturer shall provide, free of charge, product firmware/software upgrades for a period of one year from date of installation for any product feature enhancements. System firmware upgrades shall not require any exchange of parts and shall be capable of being executed via a laptop computer connection, a web browser, and the SSL protocol.

1.07 SUBMITTALS

- A. Any supplying contractor proposing equipment which is not the base standard for this specification, must provide full submittals at the time of bid. This option shall be exercised at the discretion of the owner/specifying authority.
- B. In the event the specifying authority decides to reject the submittals of a supplying contractor, the specifying authority may ask the contractor to re-submit if the discrepancies are minor. Otherwise rejection of submittals means the specified product must be supplied.

PART 2 - PRODUCTS

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
FIRE STATION ALERTING
SYSTEM
28 47 00 -1

2.01 MANUFACTURERS

- A. It is the request of the owner that bids be based only on equipment manufactured by US Digital Designs, Tempe, Arizona.

2.02 CABLING

- A. Cabling shall be in strict accordance with local codes and to the cable specifications found in the manufacturer's installation manual.

2.03 FIRE STATION CONTROLLER EQUIPMENT

- A. Furnish a G2 Fire Station Alerting System, including System Licenses, System Controllers, Peripheral Components, and Station System Services.
 - 1. All system equipment to be provided by single source or by Manufacturer's preferred components.
- B. Message Remotes, as shown on plans.
- C. Message Remote 2's, as shown on plans.
- D. Room Remote 2's, as shown on plans.
- E. HDTV Remotes, as shown on plans.
- F. Color Indicator Remote, as shown on plans.
- G. Gamma Sign, as shown on plans.

2.04 SPEAKER SYSTEMS

- A. Hallway / Room Speaker
 - 1. Speakers may be provided by Alerting System manufacturer, or contractor. Check with System manufacturer for details.
 - 2. For suspended ceiling applications, provide appropriate speaker support tile bridge. For hard ceiling applications provide appropriate speaker back box.
- B. Apparatus Room and Outdoor Speakers.
- C. LED Lighted Speaker
 - 1. Provide low-voltage LED lighted speakers as noted on drawings along with Audio.
- D. External Audio Amplifier for Apparatus Bay Applications.
- E. Low-voltage LED Strobe Light, as noted on drawings.
- F. Provide Pushbuttons as noted on drawings. Used for Alert acknowledgement, Emergency Alert or Doorbells. Can be a Normally Open (NO) pushbutton wired by a 2 conductor wire back to a Peripheral device or to Controller as noted on the drawings.

2.05 SYSTEM DIAGNOSTICS

- A. All active components in the system shall be continuously supervised for both power and data to ensure proper operation and in the case of system faults to aid in troubleshooting.
- B. All faults shall be displayed immediately on the associated Communications Gateway.

PART 3 – EXECUTION

3.01 SUPERVISION

- A. Only factory trained installers shall install, service, and maintain the specified system.

3.02 EQUIPMENT MOUNTING

- A. All equipment mounted to drywall shall use appropriate fasteners and drywall anchors. Equipment shall not be directly screwed into drywall using unapproved fasteners such as drywall or wood screws. Must use Toggle bolts when hanging the ATX Controller/Expansion Module to the wall surface. If securing it to wood use proper size lag bolts to support 50lbs or greater.

3.03 ELECTRICAL POWER CONNECTIONS

- A. It shall be the responsibility of other trades to provide the appropriate number of dedicated 120 VAC, 20A duplex outlets into the equipment cabinet rough opening. This power feed shall not have any other devices connected directly to it and shall be labeled "Station Alerting". This electrical circuit shall be connected to the fire station's emergency power system for automatic power provision during loss of utility power.
- B. Connect all system power supplies and equipment cabinets to a common earth ground utilizing a 14 AWG, or larger, solid conductor which is at minimum the same conductor size as the AC feed wires.

3.04 ENVIRONMENTAL PROTECTION

- A. Make certain that all central equipment is accessible for service. Contractor shall notify specifying authority if designated equipment closet does not meet manufacturer's requirements for heat, radiation or static electricity.

3.05 CONNECTIONS TO OTHER EQUIPMENT

- A. Lighting Controller (optional) – Connect low voltage dry contact lighting controls (provided by others) to Room Remote, Message Remote or ATU outputs. Low voltage outputs are non-inductive load, 24VDC 1A maximum. Provide an interposing relay or contactor between the low voltage output and any 120/277 VAC lighting or other load.
- B. Local Area Network (optional) - Connect the Fire Station Controller to the general purpose LAN (provided by others) located in the Fire Station. This connection shall be connected back to the central Communications Gateway to allow alerting commands to be sent from the Communications Gateway to the Fire Station Controller. In addition, the connection shall allow remote diagnostics and configuration.
- C. Radio System (optional) – Connect Audio Input #1 to the dispatch voice radio system (provided by others) as necessary to provide dispatch audio. This connection shall provide a 600 ohm impedance 0 dBm level signal.
- D. Telephone System Intercom (optional) – Connect Audio Input #3 to an Intercom output from the building telephone system (provided by others). This line shall be provided via a jack box located directly adjacent to the Station Alerting system equipment.
- E. Other Audio Source (optional) – Connect Audio Input #4 to an audio source (provided by others). This line shall be provided via a jack box located directly adjacent to the Station Alerting system equipment.
- F. Telephone System Ringdown (optional) – Connect the Ring Detector input to a telephone line (provided by others) for telephone ringing and backup alerting. This line shall be provided via a jack box located directly adjacent to the Station Alerting equipment.
- G. Connections to other customer- or contractor-provided equipment shall be made using approved methods for the type of connection. Contact manufacturer for unusual applications.

3.06 DRAWINGS

- A. Provide as-built drawings of all installed components and associated wiring on building plans.

END OF SECTION

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SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Remove planting materials within areas of work, including root systems.
- B. Remove existing site improvements, including asphalt paving, walkways, utility and irrigation system components, and related items.

1.2 REGULATORY REQUIREMENTS

- A. Conform to applicable jurisdictional authority regulations and codes for disposal of debris.
- B. Coordinate clearing work with utility companies and Facilities Departments, where appropriate.
- C. Maintain emergency access ways at all times.

1.3 REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Geotechnical Reports: "PROPOSED BALBOA LIBRARY AND FIRESTATION NO. 1; 100 AND 110 EAST BALBOA BOULEVARD NEWPORT BEACH, CALIFORNIA; PROJECT NO. W1729-88-01" dated APRIL 4, 2024 prepared by GEOCON, including any subsequent addenda
- C. Standard Specifications for Public Works Construction ("Green Book"), 2015 Edition
- D. California Department of Industrial Relations, Division of Occupational Safety and Health (CALOSHA)

1.4 EXISTING CONDITIONS

- A. Conduct demolition to minimize interference with adjacent buildings. Maintain protected egress and access at all times.
- B. Provide, erect, and maintain temporary barriers and security devices as necessary to provide safe pathways, maintaining continuous separation of construction activity from areas occupied by pedestrians.

1.5 COMPENSATION FOR DAMAGED PLANTING

- A. The Owner shall be compensated per requirements specified in the schedule below for all trees and shrubs damaged or destroyed that are intended to be protected. Compensation shall be deducted from Contractor's progress payments.
- B. Injury is defined, without limitation, as all bruising, scarring, tearing, or breaking of roots, branches, or trunk, as defined by Architect.
- C. It is and will be impracticable and difficult to determine the actual damage, whether physical or aesthetic for existing planting materials. Therefore, the Owner has assigned a total value to a tree or shrub based on its diameter at 30 inches above the ground.
- D. The total value shown shall be paid to the Owner for a tree or shrub totally destroyed.
- E. For injuries to roots or branches the Owner will assign a value proportional to the total value of the tree or shrub.
- F. Proportional amount of the total value shown shall be paid to the Owner, for each tree or shrub injured, as follows:
 - 1. Measure the diameter of the tree or shrub at 30 inches above grade level. Multiply the diameter by 3.14 to get the circumference (or, with a tape measure, measure distance around the tree or shrub).
 - 2. Divide the total value of the tree or shrub per schedule established below by its circumference at 30 inches above grade to determine a value per inch of circumference (value of tree or shrub divided by circumference equals value per inch).
 - 3. Measure the length of the injury.
 - 4. Multiply the length of the injury by the value per circumferential inch; the result is the amount of compensation for each injury (length of injury multiplied by value per inch equals compensation).
 - 5. Example:

- a. A tree with a diameter of 17 inches at 30 inches above grade is valued at \$20,000.
- b. Circumference at that point: 17 multiplied by 3.14 equals 53.38 inches.
- c. Value per inch of 17 inch diameter tree: \$20,000 divided by 53.38 inches equals \$374.67.
- d. Injury is 12 inches in length.
- e. Compensation for injury: 12 multiplied by \$374.67 equals \$4,496.04

G. Tree Value Schedule

Tree diameter at 30 inches height		Total value of tree
up to 3/4 Inch	\$	100.00
7/8 to 1 Inch	\$	150.00
1-1/8 to 2 Inches	\$	250.00
2-1/8 to 4 Inches	\$	600.00
4-1/8 to 6 Inches	\$	1,200.00
6-1/8 to 8 Inches	\$	2,400.00
8-1/8 to 10 Inches	\$	4,800.00
10-1/8 to 12 Inches	\$	9,000.00
12-1/8 to 14 Inches	\$	15,000.00
14-1/8 to 16 Inches	\$	18,000.00
16-1/8 to 18 Inches	\$	20,000.00
18-1/8Inches and over	\$	1,200.00 per inch diameter

- H. Where trees are damaged, or where limbs are required to be trimmed or removed because of operations under this contract, the cutting or removal of limbs or branches shall be performed in accordance with California Association of Certified Arborists (CACA) tree surgery practices. No damaged trees shall be removed, or pruned unless approved in advance by the Architect. All branch cuts 2 inches or more in diameter shall be treated promptly with an approved emulsified asphalt sealant.
- I. Trees or shrubs damaged by the Contractor shall have the scars treated as specified in this Section or shall be cut and removed to 24 inches below the ground and disposed of, if approved, and replaced with an equal sized tree or shrub installed at Contractor's expense. The Architect shall determine whether a damaged tree or shrub is to be repaired or replaced.

- J. The correct pruning or removal of trees or shrubs in whole or in part, as specified in the plans, is not subject to the damage provisions under this section.
- K. Repair of damaged tree or shrub will not relieve Contractor of payment for damage.

1.6 QUALITY ASSURANCE:

A. Contractor Qualifications

1. Installing Company: Company specializing in demolition and site clearing work, with minimum 5 years documented experience in projects of similar scale and scope.
2. Installing Foreman: Individual specializing in demolition and site clearing work, with minimum 5 years documented experience in projects of similar scale and scope.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to work of this section, carefully inspect previously installed work. Verify all such work is complete to the point where this installation may properly commence.
2. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
3. In the event of discrepancy, immediately notify the Architect.
4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION

- A. Verify that existing plant life and features designated to remain are tagged or identified.
- B. Protect existing items which are not indicated to be altered.
- C. Utility and Service Termination
 - 1. Locate and identify existing utility, service and irrigation system components affected by work of this contract. Review existing record drawings, conduct site investigations, contact Underground Service Alert, and implement all other means necessary to define the location of underground systems.
 - 2. Prior to beginning any demolition, properly disconnect all water, gas and electrical power supply at appropriate disconnect locations. Obtain all necessary releases and approvals from service utility companies.
 - 3. Prior to demolition or disconnect, obtain Owners approval that such system does not impact facilities or systems beyond the extent of this contract.
 - 4. Mark location of disconnected systems. Identify and indicate stub-out locations on Project Record Documents.
- D. Coordinate the time and duration of all system disconnects with Owner.
- E. Protection
 - 1. Protect utilities that remain, from damage.
 - 2. Protect trees, plant growth, and features designated to remain per Section 3.2.
 - 3. Protect bench marks from damage or displacement.

3.3 DEMOLITION

- A. General Requirements
 - 1. Prior to grading, the project area should be cleared of any existing sub-surface structures, surface vegetation, A.C., concrete, rubble, trash, pavement, debris, etc. Any buried organic debris or other unsuitable contaminated material encountered during subsequent excavation and grading work should also be removed.

2. Demolish in an orderly and careful manner. Protect existing supporting members and adjacent finishes.
3. Remove demolished materials from site as work progresses. Coordinate with Owner the time of day and route to remove demolished materials from premises. Upon completion of work, leave areas of work in clean condition.
4. Remove all buried debris, rubble, trash, or other material not deemed suitable by the Soils Engineer.
5. The removal of unsuitable materials should be conducted under the observation of the geotechnical consultant to evaluate the competency of the exposed materials for support of structural and fill loads. The excavation of unsuitable materials should be conducted in a way that minimize the disturbance of competent materials.
6. Excavations made for removal of any existing footings, utility lines, tanks, and any other subterranean structures, if encountered, on the site should be processed and backfilled, after removal of the structure, in the following manner:
 - a. Clear the excavation bottom and side cuts of all loose and/or disturbed material
 - b. Prior to placing backfill, the excavation bottom should be moisture conditioned to near optimum moisture content and compacted to at least 90 percent of the ASTM D-1557 laboratory test standard
 - c. Backfill should be placed, moisture conditioned (i.e., watered and/or aerated as required and thoroughly mixed to a uniform, near optimum moisture content), and compacted by mechanical means in approximate 6 inch lifts. The degree of compaction obtained should be at least 90 percent of the ASTM D-1557 laboratory test standard
 - d. If any of these excavations extend more than 3 feet below the proposed subgrade elevation, they should be backfilled with sand slurry (2-sack minimum) up to the bottom footing elevation
 - e. In the event that unanticipated yielding conditions are encountered at the overexcavation level, installation of stabilization elements consisting of Tensar BX 1200 geogrid, 12 inches of ¾-inch washed drain rock, and Mirafi 140 N filter fabric may be required. Detailed recommendations for the stabilization layer will be provided based on the on-site conditions encountered during grading
7. It is critical that any surficial subgrade materials disturbed during initial demolition and clearing work be removed and/or recompacted in the course of subsequent site preparation earthwork operations
8. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with specified fill material per Section 312000. Compact soil backfill to 90 percent relative compaction per ASTM D 1557.

B. Pavement Removal

1. Remove concrete sidewalk and curb where required for new construction as indicated on the Drawings.
2. Remove concrete paving by saw-cutting. Remove concrete paving and curbing at locations shown on drawings. Locate closest adjacent weakened plane joint to define start of saw-cutting.
3. Remove asphalt concrete paving by saw-cutting at locations shown on drawings. Remove asphalt paving and base material from site.

C. Landscaping and Planting Demolition

1. Remove grass and grass roots to a minimum depth of two inches below existing grade. Grub all roots to a depth of 12 inches below existing grade.
2. Remove trees and shrubs not designated to remain. Remove all stumps. Remove root ball and root systems to a depth of three feet below existing or finished grades, whichever is lower.
3. Discing and mixing of vegetation, trash, debris, and other deleterious materials with surface soils prior to grading is not permitted.
4. Remove all buried debris, rubble, trash, or other material not deemed suitable by the Soils Engineer.
5. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation per Section 312000..
6. Re-compact all subgrade materials disturbed during demolition and clearing work in accordance with Section 312000.

D. Site Utilities, Services and Irrigation System Demolition.

1. Remove conduit and conductors, piping, drains, and other associated system components within the area of the work as indicated on the plans and drawings. See Article 3.2 for requirements for maintaining existing systems in constant operation.
2. Temporarily terminate landscape system components in approved boxes or with approved caps, suitable for re-connection or extension.

E. Relocatable Structures and Fixture and Equipment Removal:

1. Remove existing relocatable structures as identified and shown on drawings and required by Architect.
2. Remove existing fixtures and equipment as identified and shown on drawings and required by Architect.

3. Verify all service connections to fixtures and equipment designated for removal have been properly disconnected.
4. Remove all conductors from conduit at all abandoned circuits.

3.4 REMOVAL

- A. Remove debris, rock, and extracted plant life from site and dispose of in accordance with the regulations of jurisdictional authority.

3.5 DUST CONTROL

- A. Provide for dust control under the provisions of Section 014500.
- B. Maintain all streets and public ways free of dust and mud as directed by local jurisdictional authority, including use of wash down and street sweeper equipment.

END OF SECTION 311000

SECTION 312000

EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS/REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Geotechnical Report: "PROPOSED BALBOA LIBRARY AND FIRESTATION NO. 1; 100 AND 110 EAST BALBOA BOULEVARD NEWPORT BEACH, CALIFORNIA; PROJECT NO. W1729-88-01" dated APRIL 4, 2024 prepared by GEOCON, including any subsequent addenda
- C. Standard Specifications for Public Works Construction ("Greenbook"), 2015 edition
- D. California Department of Industrial Relations, Division of Occupational Safety and Health (CALOSHA)
- E. Storm Water Pollution Prevention Plan: Not applicable

1.2 SUMMARY

- A. Section Includes:
 - 1. Excavating and filling for rough grading the Site.
 - 2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
 - 3. Excavating and backfilling for buildings and structures.
 - 4. Drainage course for concrete slabs-on-grade.
 - 5. Subbase course for concrete walks and pavements.
 - 6. Subbase course and base course for asphalt paving.
 - 7. Subsurface drainage backfill for walls and trenches.
 - 8. Excavating and backfilling trenches for utilities and pits for buried utility structures.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
 - 2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping, and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 3. Section 312319 "Dewatering" for lowering and disposing of ground water during construction, if applicable
 - 4. Section 315000 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.

~~1.3 UNIT PRICES~~

- ~~A. Work of this Section is affected by unit prices for earth moving specified in Section 012200 "Unit Prices."~~

~~B. Quantity allowances for earth moving are included in Section 012100 "Allowances."~~

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- F. Fill: Soil materials used to raise existing grades.
 - 1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a **42-inch** maximum-width, short-tip-radius rock bucket; rated at not less than **138-hp** flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
 - 2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.
- G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material **3/4 cu. yd.** or more in volume that exceed a standard penetration resistance of **100 blows/2 inches** when tested by a geotechnical testing agency, according to ASTM D 1586.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geotextiles.

2. Controlled low-strength material, including design mixture.
 3. Geofoam.
 4. Warning tapes.
- B. Qualification Data: For qualified testing agency.
- C. Samples for Verification: For the following products, in sizes indicated below:
1. Geotextile: 12 by 12 inches.
 2. Warning Tape: 12 inches long; of each color.
- D. Material Test Reports: From a qualified testing agency for each on-site and borrow soil material proposed for fill and backfill as follows:
1. Classification according to ASTM D 2487.
 2. Laboratory compaction curve according to ASTM D 1557.
 3. Or as stated in the project Geotechnical Report.
- E. If applicable to project, Blasting plan approved by authorities having jurisdiction.
1. If applicable, Seismic survey report from seismic survey agency.
- F. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency: The Owner will retain a testing agency qualified according to ASTM E 329 and ASTM D 3740 to conduct soil materials testing and inspection services.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify utility locator service (Underground Service Alert #811) for area where Project is located before beginning earth-moving operations. See Section 311000 "Site Clearing" for managing existing utilities on site.

- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 311000 "Site Clearing" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
1. On-site soils may be used as engineered fill provided the recommendations in the Grading Section (7.5) of the Geotechnical report are followed. Excavated on-site materials shall be removed from the site at the contractors' expense.
 2. During grading operations, soil types other than those evaluated in the geotechnical report may be encountered. The Geotechnical Engineer should be notified to evaluate the suitability of these soils for use.
 3. Oversized materials should be broken down to no greater than 3 inches in largest dimension for use in fill, used as landscape material, or disposed off-site.
 4. Obtain approval of Geotechnical Engineer of all imported fill materials prior to delivery on site and prior to placement.
- B. Satisfactory Soils: Soil Classification **Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487**, or a combination of these groups; free of rock or gravel larger than **3 inches** in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
1. Liquid Limit: **<Insert value>**.
 2. Plasticity Index: **<Insert value>**.
 3. Expansion Index (as defined by CBC Section 1803.5.3): **<50**
 - a. EI shall be limited to **no greater than 20** within the upper 5-feet of building pad subgrade or within the upper 2-feet of finish hardscape subgrade, or as retaining wall backfill
 4. A minimum resistivity value greater than 1,000 ohm-centimeters, chloride content of less than 500 ppm and sulfate content of less than 1,000 ppm and pH greater than 5.5
- C. Unsatisfactory Soils: Soil Classification **Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487**, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within **2** percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least **90** percent passing a **1-1/2-inch** sieve and not more than **12** percent passing a **No. 200** sieve.
1. Reference Greenbook Section 200-2.2
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294; with at least **95** percent passing a **1-1/2-inch** sieve and not more than **8** percent passing a **No. 200** sieve.
1. Reference Greenbook Section 200-2.2
 2. The existing asphalt concrete pavement may be pulverized and incorporated into fills or used as base material.

- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least **90** percent passing a **1-1/2-inch** sieve and not more than **12** percent passing a **No. 200** sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; angular, free of shale, flay, friable material, sand and debris, ASTM D 2940; except with **100** percent passing a **1-inch** sieve, **95 to 100** percent passing a **3/4 inch** sieve and 0 to **10 percent** passing a **No. 4** sieve.
- H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with **100** percent passing a **1-inch** sieve and **zero to 5** percent passing a **No. 4** sieve.
- I. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, or organic matter; maximum particle size and volume of 1/2 inch and 18 percent respectively, with minimum Sand Equivalent value of 30 per California Test Method 217.
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- K. Concrete Encasement: Class 480-C-2000 per Greenbook Table 201-1.1.2, as approved by Geotechnical Engineer.

2.2 PERMEABLE FILL MATERIAL

- A. Permeable Backfill at Retaining Walls: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, or organic matter.
 - 1. Graded within the following limits:

a.	SIEVE SIZE	PERCENT PASSING
b.	1 inch	100
c.	3/4 inch	90 to 100
d.	3/8 inch	40 to 100
e.	No. 4	25 to 40
f.	No. 8	18 to 33
g.	No. 30	5 to 15
h.	No. 50	0 to 7
i.	No. 200	0 to 3
 - 2. Provide material with sand equivalent exceeding 75.
- B. Interior Building Slabs:
Reference Structural and Architectural Plans and Specifications

2.3 CONTROLLED LOW-STRENGTH MATERIAL

- A. Utility Trench Backfill: Class 100-E-100 per Table 201-1.1.2 (Green Book) slurry mix, as approved by Owner and geotechnical engineer.
- B. Beneath Structures: Self-compacting, flowable concrete material produced from the following:
 - 1. CLSM sand-cement shall comply with Section 201-6 of the Greenbook Specifications, with compressive strength of 150-psi.
 - 2. Aggregates (sand) shall conform to Section 201-6 and 200-1.5 of the Greenbook Specifications.
 - 3. CLSM shall have a maximum slump of 5-inches.

4. A set of test cylinders shall be sampled for each 150-cubic yards or fraction thereof of CLSM placed per ASTM D 5971. Compressive strength testing of CLSM shall be performed in accordance with ASTM D 4832. CLSM shall also be tested for plastic unit weight in accordance with ASTM C 138. The plastic unit weight shall not deviate more and +/-10% of theoretical unit weight shown on approved mix design.

2.4 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

2.5 DESIGN CRITERIA

- A. General
 1. All improvements shall be constructed per the referenced standards, the improvement drawings, and as specified in this section.
 2. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, the more stringent criteria shall apply.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Call Underground Service Alert (811) for utility locator not less than three working days before performing Work. No Work may start until utility locate is completed for that particular area and the area is clearly defined.
- E. Additional utilities owned by the property owner may be in the project area. Notify owner at least 7 days in advance of the work to locate public or private utilities.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Vertical cuts may be used for excavations of less than 4 feet in depth. For excavation deeper than 4 feet, trench walls must be sloped above 4 feet in depth. When trenches are more than 5 feet, walls must be sloped and slopes may be no steeper than 1.5:1 without prior approval by the Geotechnical Engineer.
- B. Where there is insufficient space for sloped excavations, temporary shoring shall be used to support the sides of the excavation. Design shoring in accordance with requirements provided in Geotechnical Report for the project.
- C. Repair or replace items indicated to remain that are damaged by excavation.
- D. Establish temporary traffic control and detours when trenching. Relocate controls and reroute traffic as required during progress of Work.
- E. Notify Landscape Architect if roots from trees that are to be protected in place are encountered in excavation.
- F. Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. **24 inches** outside of concrete forms other than at footings.
 - b. **12 inches** outside of concrete forms at footings.
 - c. **6 inches** outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. **6 inches** beneath bottom of concrete slabs-on-grade.
 - f. **6 inches** beneath pipe in trenches and the greater of **24 inches** wider than pipe or **42 inches** wide.

3. Earth excavation includes excavating soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

3.5 EXCAVATION FOR STRUCTURES

- A. Overexcavation: Excavate and remove existing soils to a depth of **4-feet** below existing grade directly beneath proposed structures and laterally a minimum of **3-feet** beyond the foundation footprint, which includes perimeter spread footings for canopy of covered walkway structures.
 1. If removals beneath the proposed structures result in transitions from formational materials to fill, the formational materials should be over-excavated to provide a uniform fill thickness beneath the entire structure per details shown on plans or in Geotechnical Report.
- B. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Pile Foundations: Stop excavations **6 to 12 inches** above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- C. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Cut and protect roots according to requirements in Section 01560 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Overexcavation: Excavate and remove existing soils to a depth of **2-feet** below existing grade directly beneath proposed and laterally a minimum of **2-feet** beyond the limits of proposed walks and pavements. Near-surface soils may need to be processed to greater depths depending on the amount of drying or wetting that has occurred since initial sheet-grading operations. The actual extent of remedial grading should be determined in the field by the geotechnical engineer or engineering geologist. Overly wet surficial soils, if encountered, will need to be removed to expose existing dense/very stiff, moist compacted fill. The wet soils will require drying and/or mixing with drier soils to facilitate proper compaction.
- B. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
 1. Exposed pavement subgrade shall be scarified to a depth of 12-inches, brought to approximately **2 percent above** optimum moisture content, and compacted to at least 95 percent of the maximum dry density, as determined in general accordance with ASTM D1557.

3.7 EXCAVATION FOR FIRE TRUCK/HEAVY TRUCK PAVING

- A. Overexcavation: Excavate and remove existing soils to a minimum depth of **2-feet** below existing grade directly beneath proposed and laterally a minimum of **5-feet** beyond the limits of proposed fire truck pavements. Near-surface soils may need to be processed to greater depths depending on the amount of drying or wetting that has occurred since initial sheet-grading operations. The actual extent of remedial grading should be determined in the field by the geotechnical engineer or engineering geologist. Overly wet surficial soils, if encountered, will need to be removed to expose existing dense/very stiff, moist compacted fill. The wet soils will require drying and/or mixing with drier soils to facilitate proper compaction.
 - 1. Install Tensar InterAx NX850 geogrid or approved non-woven equivalent geotextile per manufacturer's installation instructions, place 12" of engineered fill compacted to at least 95 percent of the maximum dry density, as determined in general accordance with ASTM D1557.
 - 2. Install second layer of Tensar InterAx NX850 geogrid or approved non-woven equivalent geotextile per manufacturer's installation instructions, place additional 12" of engineered fill compacted to at least 95 percent of the maximum dry density, as determined in general accordance with ASTM D1557.
 - 3. See also Geotechnical Report, Section 7.5.7, 7.5.10, 7.5.11-7.5.13.
- B. Excavate surfaces under fire and heavy truck paving to indicated lines, cross sections, elevations, and subgrades.
 - 1. Exposed pavement subgrade shall be scarified to a depth of 12-inches, brought to approximately **2 percent above** optimum moisture content, and compacted to at least 95 percent of the maximum dry density, as determined in general accordance with ASTM D1557.

3.8 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: **12 inches each side of pipe or conduit.**
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.9 EXCAVATION FOR ELEVATOR CYLINDER

- A. Drill well hole plumb in elevator pit to accommodate installation of elevator-cylinder assembly. Coordinate with applicable requirements for diameter and tolerances in Section 142400 "Hydraulic Elevators."
- B. Provide well casing as necessary to retain walls of well hole.

3.10 SUBGRADE INSPECTION

- A. Notify Geotechnical Engineer when excavations have reached required subgrade.
- B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements locations with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Geotechnical Engineer, and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Geotechnical Engineer, without additional compensation.

3.11 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Geotechnical Engineer.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Geotechnical Engineer.

3.12 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.13 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring, bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of porous, wet, muddy, spongy, or frosty surfaces.

3.14 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of porous, wet, muddy, spongy, or frosty surfaces.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits, as follows:
 - 1. Minimum 6 inches below and 12 inches above pipe crown, under the haunches and along side the pipe, as follows:
 - a. Storm Drain: bedding course materials as defined in Section 2.1, wrapped in a non-woven geotextile fabric
 - b. Sanitary Sewer: sand as defined in Section 2.1
 - c. Domestic/Recycled and Fire Service Water: sand as defined in Section 2.1
- C. Trenches under Footings: Backfill trenches excavated under footings and within **18 inches** of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in **Section 033000 "Cast-in-Place Concrete."**
- D. Trenches under Roadways: Provide **4-inch-** thick, concrete-base slab support for piping or conduit less than **30 inches** below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of **4 inches** of concrete before backfilling or placing roadway subbase course. Concrete is specified in **Section 033000 "Cast-in-Place Concrete."**
- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Initial Backfill:
 - 1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than **1 inch** in any dimension, to a height of **12 inches** over the pipe or conduit.
 - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
 - 2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:

1. Unpaved areas: Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Paved areas: Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
3. Concrete encase where indicated on plans, as defined in section 2.1.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.15 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place backfill on subgrades free of porous, wet, muddy, spongy, or frosty surfaces.

3.16 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to approximately **2 percent above** optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.17 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than **8 inches** in loose depth for material compacted by heavy compaction equipment and not more than **4 inches** in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to **ASTM D 1557**:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top **12 inches** of existing subgrade or excavation bottom and each layer of backfill or fill soil material at **95** percent.

2. Under walkways, scarify and recompact top **12 inches** below subgrade or excavation bottom and compact each layer of backfill or fill soil material at **92** percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at **85** percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at **85** percent.

3.18 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 1. Turf or Unpaved Areas: Plus or minus **1 inch**.
 2. Walks: Plus or minus **1 inch**.
 3. Pavements: Plus or minus **1/2 inch**.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of **1/2 inch** when tested with a 10-foot straightedge.

3.19 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 1. Install separation geotextile on prepared subgrade, where indicated, according to manufacturer's written instructions, overlapping sides and ends.
 2. Place base course material over subbase course under hot-mix asphalt pavement.
 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 6. Compact subbase course and base course at approximately **2 percent above** optimum moisture content to required grades, lines, cross sections, and thickness to not less than **95** percent of maximum dry unit weight according to ASTM D 1557.

3.20 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 2. Determine that fill material classification and maximum lift thickness comply with requirements.

3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least **one test** for every **2000 sq. ft.** or less of paved area or building slab but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every **100 feet** or less of wall length but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every **150 feet** or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace soil material to depth as directed by Geotechnical Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

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SECTION 31 23 19 DEWATERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation.
- B. Operation.
- C. Water disposal.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.03 RELATED SECTIONS

- A. 01 35 10 - Sustainability (CAL Green) Requirements.
- B. 01 50 00 - Temporary Facilities and Controls.
- C. 01 74 19 - Construction Waste Management and Disposal.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate dewatering with excavation.
- B. Preinstallation Meetings: Review site conditions, proposed excavation, existing utilities, and geotechnical report with Architect.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Designer's qualification statement.
- C. Installer's qualification statement.
- D. Field Quality Control Submittals:
 - 1. Document water level measurements.
 - 2. Document existing structure survey results.
 - 3. Document visual inspections of dewatering.

1.06 FIELD CONDITIONS

- A. Existing Conditions: See site and utility survey, geotechnical report, hazardous material survey, existing conditions survey, and site drawing; see Section 00 31 00 - Available Project Information.
- B. Discharge Water: Comply with requirements, see Section 01 57 13 - Temporary Erosion and Sediment Control.

1.07 QUALITY ASSURANCE

- A. Subcontractor to have minimum 10 years experience in dewatering.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Preinstallation Testing: Measure prevailing groundwater level.
- B. Verify survey bench mark elevations are as indicated on drawings.
- C. Survey adjacent structures and exterior improvements to establish bench mark elevations.
- D. Verification of Conditions:
 - 1. Discharge area elevations and gradients.
 - 2. Potential dewatering system interference areas with adjacent facilities and infrastructure.
- E. See Section 01 71 23 - Field Engineering, for additional requirements.

3.02 OPERATION

- A. The Contractor shall provide and maintain at all times during construction, ample means and devices with which to promptly remove and properly dispose of all water, from any source, entering the excavations or other parts of the work. Dewatering shall be accomplished by methods which will ensure a dry excavation and preservation of the lines and grades of the bottoms of excavations. For pipeline work, the methods may include sump pumps, deep wells, well points, suitable rock or gravel placed below the required bedding for draining and pump purposes, temporary pipeline and other means.
- B. Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall be continuous until such times as water can be allowed to rise in accord with the provisions of this section or other requirements.
- C. Standby pumping equipment shall be provided on the jobsite. A minimum of one standby unit (one for each ten in the event well points are used) shall be available for immediate installation should any well unit fail. The design and installation of well points or deep wells shall be suitable for the accomplishment of the work.

3.03 WATER DISPOSAL

- A. Disposal of water from dewatering operations shall be the sole responsibility of the Contractor and shall comply with required Special Purpose Discharge Permit.
 - 1. The Contractor shall dispose of the water from the work in a suitable manner without damage to adjacent property. Conveyance of the water shall be such as to not interfere with traffic flow.
- B. Water shall be desilted before disposal to any sewer system. The system used for desilting the water shall be baffled structure and shall provide not less than five minutes detention time and shall be designed to have a "flow-through" velocity not exceeding 0.2 feet per second at the anticipated peak flow. The desilting box shall be cleaned as required to maintain the detention time and flow-through limitations specified above.
- C. The Contractor shall ensure that all extracted and discharged water meets the requirements of the Special Purpose Discharge Permit water quality criteria.

3.04 PROTECTION

- A. Protect installed dewatering system from subsequent construction operations.
- B. Promptly repair dewatering system damages restoring operation.

END OF SECTION

SECTION 315000

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes temporary excavation support and protection systems.
- B. Related Sections include the following:
 - 1. Section 015000, "Temporary Facilities and Controls" for temporary utilities and support facilities.
 - 2. Section 312000, "Earth Moving" for excavating and backfilling.
 - 3. Section 03-03361, "Shotcrete" for use in excavation support and protection.

1.2 PERFORMANCE REQUIREMENTS

- A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
 - 1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified California Registered Professional Engineer.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.

1.3 SUBMITTALS

- A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.
 - 1. Include Shop Drawings signed and sealed by the qualified California Registered Professional Engineer responsible for their preparation.
- B. Qualification Data: For Installer and California Registered Professional Engineer.
- C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems.

1.4 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by City of Newport Beach (Agency) or others unless permitted in writing by Agency's Representative and then only after arranging to provide temporary utility services according to requirements indicated.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Agency will not be responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
 - 2. Refer to geotechnical report in RFP, Agency Furnished Information (Section 23)
- C. Survey adjacent structures and improvements, employing a registered, professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
 - 1. During installation of excavation support and protection systems, regularly re-survey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Agency's Representative if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Agency's Representative. Provide alternate routes around closed or obstructed traffic ways if required by Agency's Representative.
- C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces is not impeded.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER BEAMS AND LAGGING

- A. Install steel soldier beams before starting excavation. Space soldier beams at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- B. Install wood lagging within flanges of soldier beams as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.
- C. Install swales horizontally at centers indicated and secure to soldier beams.

3.5 BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
 - 1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by Agency's Representative.
 - 2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
 - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 MAINTENANCE

- A. Maintain temporary excavation support and protection systems on a continuing basis until removal.
- B. Inspect and resurvey all benchmarks at least once per week on a continuing basis to detect any cracks, sags, settlement, movement or other damage. All results shall be accurately logged. Promptly notify the Agency's Representative of any changes in elevations or positions.
- C. If movement is detected, initiation immediate corrective action to correct the movement and prevent further negative movements

3.7 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
- B. All wooden members included as part of the temporary excavation support and protection systems shall be removed. Steel sheet pile shall either be removed or cut off and left in place. If cut off, the top of the portion left in place shall be a minimum of 3' and maximum of 4' below finished surface.
- C. All soil compaction requirements on both sides of the temporary excavation support and protection systems during removal shall be as required and approved by the Soils Engineer of Record..

END OF SECTION 315000

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SECTION 321216

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Asphalt concrete pavement.
- B. Aggregate base course.
- C. Paving accessories as specified.

1.2 REFERENCES

- A. Standard Specifications for Public Works Construction (SSPWC - "Green Book") 2015 Edition, State of California, Department of Transportation (CalTrans), Standard Specifications, including amendments.
- B. Geotechnical Report:
"PROPOSED BALBOA LIBRARY AND FIRESTATION NO. 1; 100 AND 110 EAST BALBOA BOULEVARD NEWPORT BEACH, CALIFORNIA; PROJECT NO. W1729-88-01"
dated APRIL 4, 2024 prepared by GEOCON, including any subsequent addenda
- C. ASTM D 1188 - Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures
- D. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
- E. ASTM D 2170 - Test Method for Kinematic Viscosity of Asphalts (Bituminous)
- F. ASTM D 2172 - Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

1.3 SUBMITTALS

- A. Mix Design: Submit asphalt mix design prepared by a certified laboratory, selected by Owner and acceptable to Owner, for review and approval.
- B. Accompanying mix design, submit materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE MATERIAL

- A. Provide "Crushed Aggregate Base" per SSPWC Section 200-2.2, or Class 2 aggregate base per SSPWC Section 200-2.4.
- B. Use of asphalt paving processed as miscellaneous base as specified in Section 311201 is permitted.

2.2 ASPHALTIC CONCRETE PAVEMENT MATERIALS

- A. Asphaltic Concrete Pavement Mixture:
 - 1. Mix Characteristics:
 - a. Vehicular Paving: Type III, Class C2 per SSPWC Section 203-6
 - b. Pedestrian and playground surfaces: Class D1 per SSPWC Section 203-6
 - 2. Asphalt type: Provide AR-4000 per SSPWC Section 203-1
 - 3. Asphaltic concrete pavement shall be produced at a commercial central mixing plant.
- B. Tack Coat: Slow setting asphalt emulsion SS1h per SSPWC Section 203-3
- C. Tack Coat at pavement fabric: Provide AR4000 paving asphalt in compliance with SSPWC Section 302-7.2.2
- D. Herbicide: Provide approved herbicide, tinted for visual identification, non-flammable formulation, and complying with all current California and EPA environmental regulations.
- E. Surface Sealer: Asphalt Emulsion, www.aema.org, SS1-h, per SSPWC Section 203-9
- F. Surface Sealer: Satin Seal by Blue Diamond or equal.
- G. Crack filler:
 - 1. Cracks less than 1/2 inch in width: GuardTop Crackfiller or equal.
 - 2. Cracks 1/2 inch or greater in width: #4 Sheet mix asphalt.

2.3 REDWOOD HEADERS

- A. Provide Redwood stakes and headers, construction heart per CRIS grading rules, sized in accordance with SSPWC Section 302-5.5

2.4 PAVEMENT REINFORCING FABRIC

- A. Provide Amoco or equal, available through Industrial Asphalt phone (310) 926-9422, Petromat pavement fabric complying with SSPWC Section 213

2.5 LIME TREATMENT

- A. Provide quicklime conforming to Green Book Section 301-5.2(A)

2.6 OTHER MATERIALS

- A. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

2.7 DESIGN CRITERIA

- A. General:
 - 1. All improvements shall be constructed per the referenced standards, the contract documents, and as specified in this section.
 - 2. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, the more stringent criteria shall apply.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS AND PREPARATION

- A. Inspection:
 - 1. Prior to work of this section, carefully inspect previously installed work. Verify all such work is complete to the point where this installation may properly commence.
 - 2. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
 - a. Verify subgrade is compacted as specified in Section 312000.
 - 3. In the event of discrepancy, immediately notify the Architect.
 - 4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
 - 5.
- B. Preparation:
 - 1. Provide all staking and field engineering required to implement the work as shown on the drawings by a Land Surveyor licensed in the State of California.
 - 2. Protect all stakes and benchmarks. Replace all stakes and benchmarks damaged during the course of construction at no cost to Owner.
 - 3. Set grade stakes using instrument technology, at 25 foot grid interval at areas with gradients greater than 2 percent.

4. Set grade stakes, using instrument technology, at 10 foot grid interval at areas with gradients less than 2 percent.
5. Provide all equipment of such type, function and design as required to achieve specified values.

3.2 APPLICATION OF SOIL TREATMENTS

A. Herbicide Treatment:

1. Apply in strict accordance with Manufacturer's recommendations.
2. Conform to all applicable and current regulations, including CAL-OSHA, air quality and environmental requirements.
3. Do not apply herbicide within a minimum distance of two feet from planted areas.
4. If requested by Architect, provide written certification of purchase and application of herbicide.

B. Lime Treated Subgrade:

1. Apply in accordance with Greenbook Section 301-5 and as directed by the Geotechnical Engineer.
2. Conform to all applicable and current regulations, including CAL-OSHA, air quality and environmental requirements.
3. Apply treatment to a depth of 12 inches at a rate of 3 percent per dry unit weight of subgrade soil.

3.3 PLACEMENT OF AGGREGATE BASE COURSE

A. Deliver base course to site as uniform mixtures.

B. Spread each layer in one operation, free from pockets of coarse or fine material, and in compliance with SSPWC 302-2

1. Where asphalt paving is installed to replace existing on-site locations, match existing base thickness.
2. Where asphalt paving is installed at public improvements, comply with base thickness required by referenced City standards.
3. Where asphalt paving is installed at areas without prior paving, provide minimum 6 inch compacted base thickness.
4. Do not use lime treatment in areas where landscaping and/or trees will be placed.

C. Application:

1. Where the required thickness is 0.5 foot or less, spread and compact base in one layer.
2. Where the required thickness is more than 0.5 foot, spread and compact base material in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 0.5 foot, or less if compaction cannot be obtained with 0.5 lift.

- D. Each layer shall be spread and compacted in a similar manner. When vibrating or other acceptable types of special compacting equipment are used, the entire course may be placed in one layer, provided the ability of such equipment to achieve acceptable compaction to the full layer depth is demonstrated.
- E. No thin layers of fine materials shall be added to the top layer of the subbase or base course in order to meet the grade.

3.4 BASE COURSE COMPACTION AND PROTECTION

- A. Compact base course material to not less than 95 of the maximum laboratory density as determined by ASTM D-1557.
- B. Remove damaged base course to subgrade and place, grade and compact new base course in settled, eroded, and wetted areas to specified tolerances.
- C. Where completed base course areas are disturbed by subsequent construction operations or adverse weather, remove base course in damaged areas to subgrade, and place and compact new base course to required density prior to further construction.

3.5 PREPARATION FOR PAVING

- A. Apply tack coat to vertical faces of existing or previously constructed bituminous pavement, curbs, gutters, slab edges, and all structures to be in actual contact with the bituminous pavement.
- B. Coat surfaces of catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.
- C. Prior to applying the tack coat, sweep or otherwise clean surface free of dust or other foreign material.
- D. Protect all surfaces not required to receive tack coat from any inadvertent application.
- E. Do not place tack coat when air temperature in the shade or the roadbed temperature is below 50 degrees F, or during rain, fog, or other adverse weather conditions.
- F. After application of tack coat, allow sufficient time for complete separation of asphalt and water before paving operations begin. Do not leave tack coat exposed overnight. Apply tack coat to only those surfaces as will be paved in the same day.
- G. Apply primer coat to base course surfaces in conformance with Section 302-5.3, SSPWC, at rate of 0.10 to 0.25 gallons per square yard. Allow to cure prior to application of asphalt course.
- H. Asphalt Pavement Crack Preparation:
 - 1. All asphalt cracks shall be cleaned, prepared and filled prior to application of tack coat.
 - 2. All vegetation shall be removed from cracks and blown clean with compressed air.
 - 3. Cracks shall be treated with specified soil sterilizer prior to placement of filler material.
 - 4. Cracks shall be completely free of any moisture before application of filler. Sufficient amount of crack filler shall be used to ensure a level surface after filler is cured.
 - 5. Multiple coats may be required, within Manufacturer's recommendations.

6. Asphalt pavement cracks less than 1/2 inch wide shall be filled with rubberized crack filler as specified.
7. Asphalt pavement cracks 1/2 inch wide or larger shall be filled with #4 sheet mix asphalt.

I. Pavement Fabric Applications:

1. Prepare paving as recommended by fabric manufacturer and as specified.
2. Fill all joints, cracks, alligating and other surface defects with approved asphaltic crack filler or sealant.
3. Install minimum 1/2 inch asphalt concrete leveling coat, mix as approved by Architect.
4. Apply tack coat per SSPWC Section 302-7.2.2 and as recommended by manufacturer.
5. Install fabric per SSPWC Section 302-7.2.3 and as recommended by manufacturer.

3.6 PLACEMENT OF ASPHALTIC CONCRETE PAVEMENT

- A. Conform to SSPWC Section 302-5
- B. When atmospheric temperatures are below 70 degrees F, all truck loads shall be covered with tarpaulins. Truck beds shall be covered when loaded at the asphalt plant and until the asphalt concrete is transferred directly into the paver's hopper.
- C. Do not place asphaltic concrete paving when the air temperature in the shade or the roadbed temperature is below 50 degrees F, or during rain, when the base course surface is wet, or during other adverse weather conditions.
- D. Place asphalt pavement as required to provide compacted depth as indicated on the plans, in a continuous operation. Place inaccessible and small areas by hand.
 1. Provide minimum 3 inch compacted thickness or as required to match existing, whichever is greater.
 2. Where asphalt paving is installed to replace existing on-site locations, install in compacted thickness to match existing paving.
 3. Where asphalt paving is installed over pavement fabric, provide minimum 1-1/2 inch compacted thickness.
 4. Where asphalt paving is installed at public improvements, comply with compacted paving thickness required by referenced City standards.
 5. Where asphalt paving is installed at areas without prior paving, provide minimum 3 inch compacted thickness.
- E. Place asphalt in single or multiple lifts per SSPWC Section 302-5.5
- F. Ensure joints made during paving operations are straight, clean, vertical and free of broken or loose material. Carefully make joints to ensure a continuous bond between old and new pavement, or between successive day's work. Provide a continuous bond between adjoining work.

- G. At all unrestrained paving edges, provide redwood headers flush with asphalt concrete surface, with stakes placed at 3 feet on center maximum, located 1/2 inch below top of header.

3.7 ROLLING

- A. Monitor temperatures of the asphalt concrete mixture as delivered to the site and during laydown to ensure conformance with SSPWC Section 302-5.5
- B. Roll and compact to specified density in accordance with SSPWC Section 302-5.6.
- C. Compact asphalt paving course to 95 percent of the maximum laboratory density based on the Hveem unit weight, as obtained with the California Kneading Compactor, per California Test 304.
- D. Perform hand tamping in areas not accessible to rolling equipment.

3.8 FIELD QUALITY CONTROL

- A. Testing and inspection of asphaltic concrete mix and asphalt pavement will be performed at Contractors cost by a testing laboratory retained by the Contractor and acceptable to the Owner. Restoration of core areas shall be performed at the Contractor's cost. The testing laboratory, except for the contract relationship required for this project, shall have no financial or fiduciary relationship with Contractor or paving installer.
- B. Thickness Cores:
 - 1. Provide 1 core test per each 5,000 square feet [or each repair area] to verify compacted thickness.
- C. Density Tests:
 - 1. Provide field density tests indicating compliance with SSPWC Section 302-5.6.2 based on use of properly calibrated nuclear asphalt testing device.
 - 2. Provide density tests based on ASTM D 1188 for laboratory analysis of asphalt cores.
 - 3. In the event of disputes over in-place density, conduct tests based on ASTM D 1188 with test samples taken at such frequency as directed by Architect.
- D. Surface smoothness, thickness and level.
 - 1. Maintain surface free of gouges, ridges and ruts, with a uniform and consistent finish.
 - 2. Maintain line and profile shown to tolerance of 1/4 inch plus/minus, in any 10 feet, non-cumulative.
 - 3. Maintain asphalt pavement free from depressions exceeding 1/8 inch when measured with a 10 foot straight-edge.
- E. Flood Test:
 - 1. Flood test paving prior to application of seal coat.
 - 2. Where water ponds in excess of 1/8 inch in an area greater than 2 feet in any direction, repair or replace as directed by Architect to provide proper drainage.

3.9 SEAL COAT

- A. Allow completed paving to cure for minimum of 1 month prior to application of specified seal coat.
- B. Conform to the manufacturer's recommendations for two coat application.
- C. Conform to SSPWC Section 302-8.2 for application.
- D. Provide surface finish free of ridges, lap marks, coarse textured areas, or other appearance and performance defects.

3.10 PAINT STRIPING AND MARKING

- A. Install per Section 321723 and Caltrans Specifications.

3.11 PROTECTION

- A. After final rolling, do not permit vehicular traffic on pavement until it has cooled to atmospheric temperature and hardened, but in no case less than 8 hours.
- B. Erect barricades in accordance with requirements of Division 1 to protect paving from traffic until mixture has cooled in accordance with the specifications.
- C. Do not use completed paving surface for storage of construction vehicles or construction materials.

END OF SECTION 321216

SECTION 321313
CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work in this Section includes, but is not necessarily limited to, concrete paving, walkways, curbing/gutters, and driveways as shown on drawings and specified below.

B. Construction Means, Methods, Techniques, Sequences and Procedures.

1. The Contractor is solely responsible for, and has sole control over, construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the Work under the Contract.

2. Shoring, including shoring for structural foundations, structures, and trenching, that is required to complete the Work, is considered a method or technique and is the sole responsibility of the Contractor. If a regulatory agency requires a licensed Engineer to design, approve or provide drawings for shoring, then it is the sole responsibility of the Contractor to contract with a qualified Engineer for shoring design services.

3. Provide all necessary construction means, methods, techniques, sequences and procedures, including shoring design, for coordinating and completing all portions of the Work.

1.2 REFERENCES

Standard Specifications

1. Standard Specifications for Public Works Construction (SSPWC – “Greenbook”) 2015 Edition

2. State of California Department of Transportation Specifications (Current Edition)

3. Geotechnical Report: “PROPOSED BALBOA LIBRARY AND FIRESTATION NO. 1; 100 AND 110 EAST BALBOA BOULEVARD NEWPORT BEACH, CALIFORNIA; PROJECT NO. W1729-88-01 dated APRIL 4,2024 prepared by GEOCON, including any subsequent addenda

1.3 SUBMITTALS

A. Materials List/Samples

1. Provide complete list of proposed materials for the Client’s Representative review.

2. Accompanying Materials List, submit proposed aggregate for color approval.

B. Mock-up

1. No mock up required

C. Mix Design

1. Prior to installing concrete paving, submit a complete mix design for each mix that will be provided for the Work. Include water/cement ratio, size of coarse aggregate, amount of any admixtures, minimum compressive strength, maximum slump, air content percentage, and batch plant source.
2. Mix design shall be prepared by batch plant supplying concrete.
3. Changes in batch plant will require complete resubmittal process.

D. Quality Assurance

1. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
2. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

E. Jointing Plan

1. Provide jointing plan for the Client's Representative review

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- A. All improvements shall be constructed per the referenced standards, the improvement drawings, and as specified in this Section.

2.2 CAST-IN-PLACE CONCRETE

A. General

1. All concrete shall be transit mixed, complying with ASTM C94.
2. All concrete shall be supplied from a single source, using a single cement supplier.
3. All cement shall be Portland cement, Type II, low alkali per ASTM C150, or Type V, and produced within the United States.

B. Product Characteristics: Paving/Flatwork:

1. Compressive Strength: 4000 psi for vehicular paving, 3250 psi for pedestrian.
2. Coarse Aggregate:
 - a) Class C, No. 4 sieve, per Standard Specification Section 200-1.4.
 - b) Aggregate shall be non-reactive per ASTM C 289, and shall comply with ASTM C33, Table 3, Class 4M.
 - c) Aggregate shall be batch plant selected to provide tan to buff color range. Aggregates exhibiting red, black or gray color range shall not be used.
3. Cement Content: 560 pounds per cubic yard concrete
4. Slump: 4 inch maximum
5. Finish: See 3.3 below
6. Water-Cement Ratio: 0.55 maximum range per Standard Specification Section 201-1.3.3

7. Color: As selected by Architect from manufacturer's full range

C. Product Characteristics: Curbing, gutters, related drainage components.

1. Compressive Strength: 3250 psi per "Standard Specifications"

2. Aggregate: Class C per "Standard Specifications"

3. Cement Content: 560 pounds per cubic yard concrete

4. Slump: 4 inch maximum

5. Finish: Per Section 303-5.5.2 of "Standard Specifications," and with flatwork finishes as defined in this Section

6. Water-Cement Ratio: 0.55 maximum range per Standard Specification Section 201-1.3.3

2.3 PAVING BASE

A. All aggregate base material shall conform to Class 2 aggregate base as defined in Section 26-1.02A of the latest edition of the Caltrans Standard Specifications.

B. Alternatively, base material should conform to the specifications for crushed aggregate base, crushed miscellaneous base, or processed miscellaneous base as defined in Section 200-2 of the latest edition of the Standard Specifications for Public Works Construction, "GREENBOOK", or to the specifications for Class 2 aggregate base as defined in Section 400-2.4 of the Regional Supplement Amendments to the "Greenbook".

2.4 REINFORCING STEEL

A. All deformed bar shall comply with Standard Specifications and per Drawings. Size per plan. Expansion joint dowels shall be smooth, per ASTM A615.

2.5 EXPANSION JOINT MATERIAL

B. Product Description

1. Series: W.R. Meadows Asphalt Expansion Joint or equal

3. Material: Asphalt

4. Thickness: 1/4" minimum thickness.

2.6 PAVEMENT JOINT SEALANT

A. Preformed Type "B" Elastomeric sealant per Greenbook Standard Specification Section 201-3.5. When adjacent to integral color concrete, color shall match integral color.

2.7 WEAKENED PLANE JOINTS

A. Provide saw-cut or tooled weakened plane joint, 1/4 inch wide, extending minimum 1 inch below concrete surface. Provide hand sawn joints or other approved method where saw equipment is not feasible.

2.8 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.9 SURFACE RETARDER

- A. L.M. Scofield Lithotex top surface retarder.

2.10 TRUNCATED DOMES

- A. Provide cast in place truncated domes which comply with the current Americans with Disabilities (ADA) guidelines.
- B. Cast in place truncated domes shall be two-part, replaceable units, and Color Federal Yellow #33538.
- C. Manufacturers: Access Tile, ADA Solutions, Armor Tile, or equal.
- D. Size: 36"x48" rectangular panels

2.11 OTHER MATERIALS

- A. All other materials not specifically described but required for complete and proper installation of this work, shall be selected by the contractor and subject to the approval of the Owner's Representative.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that concrete pavement may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
3. Prior to paving the site, the exposed pavement subgrade should be scarified to a depth of 12 inches, brought to approximately optimum moisture content, and compacted to at least 95 percent of the maximum dry density, as determined in general accordance with ASTM D1557.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Client's Representative.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 FORMWORK

A. General

1. Construct forms accurately to dimensions, plumb and true to line and grade. Use forms that are substantial, mortar tight, braced and tied so as to maintain position and shape during placing of reinforcing and concrete.
2. Wavy surfaces and bulged walls or slab surfaces resulting from settlement or springing of formwork will be rejected.
3. Carefully verify and check all forms for alignment and level as the work proceeds. Promptly make all needed adjustments or additional bracing.

B. Construction Joints: Construct and assemble forms in such a manner that joints occur at accepted locations. Thoroughly clean forms before pouring concrete.

C. Details: Take extreme care in all details of forming, setting and reinforcing. Except where tooled or radiused corners are indicated, provide all exposed concrete finish work with smooth, even surfaces of dense concrete with clean sharp arises and outside corners.

D. Prior to Pouring Concrete

1. Thoroughly clean out all forms to be used.
2. Thoroughly wet wood forms as required where form coatings are not used.

E. Removal of Forms:

1. Do not remove supporting forms or shoring until concrete has sufficient strength to carry its own weight and other loads upon it.
2. Remove forms only after concrete has properly set and without damaging concrete.

3.3 CONCRETE PAVING INSTALLATION

A. Preparation

1. Subgrade shall be fine graded per Section 312000 of this specification as applicable. The finished subgrade shall be tested and approved by the Soils Engineer prior to the placement of base.
2. Verify sub-grade, base material, conduit, and all other embedded items are properly located in relation to concrete paving. Verify all grades for pitch and fall prior to pouring pavements.
3. Verify that all cross-fall and ramp criteria comply with Title 24 & ADAAG requirements.
4. The aggregate base shall be compacted to at least 95 percent of the maximum dry density, as determined in general accordance with ASTM D1557.
5. "Neat Pouring" or placement of concrete against an existing surface without formwork, such as asphalt concrete, is not permitted.

B. Placement

1. Place specified base material over compacted sub-grade to thicknesses shown on drawings, with minimum thickness of 4 inches. Compact with hand roller or suitable alternate.
2. Install all curbing, cross gutters, and related improvements per Section 303-5 of the "Standard Specifications," as specified, and as shown on drawings. Where machine formed curbing is provided, tolerances and joint control specified for fixed form construction shall be met.
3. All reinforcing shall be placed on approved concrete or plastic supports. "Hook and Pull" method of reinforcing placement not acceptable. Lap all mesh minimum 12" at edges.

C. Finishing

1. Light to Medium Exposed Aggregate:

- a. Place concrete per L.M. Scofield Application Instruction T-203. All concrete shall be natural gray in color and either acid washed or sandblasted.
- b. Apply top surface retarder.
- c. Texture shall match approved mock-up. Use abrasive material of proper type and gradation to expose the aggregate.
- d. Sandblasting operations shall be in conformance with local air quality standards.
- e. See section 5 of DPP for color palette guidelines.

2. Standard Grey Concrete with medium broom finish:

- a. Just before the concrete hardens, finish the surface with a wood float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

3. Enhanced Concrete, standard gray with medium sandblast finish:

- a. Finishes shall match the approved mock-up panels, and have a uniform color and texture over the entire area. Surfaces shall be free of ruts, grooves, dimples, or swirl marks resulting from the sandblast operations. Edges shall be crisp and true to lines, and have finishes consistent with the field.
- b. Sandblast finish paving to match approved mock-up.
- c. Perform sandblasting in as continuous an operation as possible, utilizing same work crew to maintain finish continuity.
- d. Provide sandblasting to a finish as indicated on Drawings.
- e. Depth of Etch: Use an abrasive sand of the required gradation and grit to expose paving surface to achieve specified etch:
 1. Light Sand Blast: Approximately 1/32 to 3/32-inches deep.
 2. Medium Sand Blast: Approximately 1/16 to 1/8-inches deep.
 3. Heavy Sand Blast: Approximately 3/32 to 5/32-inches deep.
- f. Carefully blast corners and edges of paving using appropriate backup boards, in order to maintain a uniform corner or edge finish as well as prevent blast damage to adjacent surfaces and landscaping.
- g. Use same nozzle, nozzle pressure and blasting technique as used to prepare initial paving mock-ups. Exercise care to provide even and consistent strokes with air nozzle to minimize pockmarking of paving surface.
- h. Cleanup and remove expended sand particles, concrete dust, loose aggregate, and other work-related debris at end of each day's blasting operations.

D. Joint Treatment

1. Provide construction, expansion, and weakened plane joints at locations shown on drawings, and at 15 feet minimum spacing in any direction. Joints with tooled edges shall have 1/8 inch radius.
2. Properly prepare edges of joints prior to proceeding with subsequent operations. Remove all contaminants, laitance, oil, and other deleterious substances prior to installing joint sealant.
3. Install joint sealant at all weakened plane and expansion joints per manufacturer's recommendations. Provide bond breaker at expansion joint filler.
4. Tool joint sealant concave. Remove excess from joint edges.

3.4 CONCRETE CURING

A. General

1. All natural colored slabs shall be water cured by means of fine mist spray. Maintain in damp condition for a period of seven (7) days after pouring.
2. Provide wind barriers and other screening as necessary to avoid rapid drying.
3. Cure all integral color concrete with Lithochrome curing wax, applied as directed by Scofield.

B. Alternate: Where natural color concrete is not adjacent to integral colored concrete, use of specified curing/hardener compound may be acceptable with prior Client's Representative approval.

3.5 FIELD QUALITY CONTROL

A. Inspection and Testing

1. Coordinate taking of concrete cylinders for testing of concrete paving per Divisions 1 and 3.
2. Evaluate surfaces for grade and drainage. Correct all non-conforming surfaces, ponds, and other irregularities to the satisfaction of the Client's Representative.

3.6 TOLERANCES

A. General: Variations below list the maximum permissible deviations from established lines, grades and dimensions for all exposed concrete paving.

B. Variation from Plumb:

1. In the lines and surfaces of walls and pavements: In 10 feet, maximum 1/4 inch.
2. For exposed corners, control-joint grooves and other conspicuous lines:
 - a. In any 10 feet, maximum 1/4 inch
 - b. In any 20 feet or more, 1/2 inch

C. Variation from the Level or from the Grades shown per Drawings:

1. In pavements, walls and tops of curbing: In any 10 feet, 1/4 inch

2. For exposed joints and other conspicuous lines: In any 10 feet, maximum 1/4 inch

D. Variation in Cross-Sectional Thickness of Slabs and Walls, without reducing tolerances established for line, plumb, and level: Minus 1/4 inch; Plus 1/2 inch

E. Variation in Radii

1. In radii of less than 10 feet:

- a. In any 5 feet, 1/8 inch
- b. In any 10 feet, 1/4 inch

2. In radii of 20 feet:

- a. In any 10 feet, 1/4 inch
- b. In any 20 feet, 3/8 inch

3. In radii of 30 feet or more:

- a. In any 20 feet, 1/2 inch
- b. In any 30 feet, 1 inch

END OF SECTION 321313

SECTION 32 17 10 PARKING BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Parking bumpers.

1.02 RELATED REQUIREMENTS

- A. Section 32 12 16 - Asphalt Paving.
- B. Section 32 13 13 - Concrete Paving.
- C. Section 32 17 23 - Pavement Markings.

1.03 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- B. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.
- C. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

PART 2 PRODUCTS

2.01 PARKING BUMPERS

- A. Nominal Size: 6 inches high, 8 inches wide, 6 feet long.
- B. Profile: Manufacturer's standard.
- C. Anchoring Holes: Two, spaced equally.
- D. Precast Concrete:
 - 1. Cement: Portland Type I - Normal in accordance with ASTM C150/C150M.
 - 2. Aggregate: Lightweight in accordance with ASTM C33/C33M.
 - 3. Reinforcement: Deformed, epoxy-coated steel bars in accordance with ASTM A615/A615M.
 - 4. Color: Natural.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that pavement is ready to receive work, and pavement markings are dry.

3.02 PREPARATION

- A. Surface Preparation: Clean pavement surface and surrounding area.

3.03 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work, as indicated on drawings.
- C. Concrete Pavement: According to manufacturer's recommendations.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Inspect for placement, as indicated on drawings.
- C. Nonconforming Work: Remove and reinstall.

3.05 ADJUSTING

- A. Limit adjustments and repositioning units within first hour of adhesive application.

3.06 CLEANING

A. Remove excessive adhesive immediately after application.

3.07 PROTECTION

A. Protect installed parking bumper from disturbance for 4 hours after adhesive application.

END OF SECTION

SECTION 321723

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Traffic lines and markings.
2. Legends.
3. Paint.
4. Glass beads.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.

B. Federal Standards

1. 595 Paint Spec: #35180 color blue

C. ASTM International:

1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
3. ASTM D562 - Standard Test Method for Consistency of Paints Using the Stormer Viscometer.
4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
6. ASTM D969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
7. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
8. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
9. ASTM D1475 - Standard test Method for Density of Liquid Coatings, Inks, and Related Products.
10. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
11. ASTM D2202 - Standard Test Method for Slump of Sealants.
12. ASTM D2371 - Standard Test Method for Pigment Content of Solvent Reducible Paints.
13. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids from Solvent-Reducible Paints.
14. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

1.3 PERFORMANCE REQUIREMENTS

A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.

B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

- B. Product Data: Submit paint formulation for each type of paint.
- C. Test Reports: Submit source and acceptance test results in accordance with AASHTO M247.
- D. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Greenbook 2015 standards.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.
- C. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- C. Do not apply exterior coatings during rain when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
- D. Do not apply paint when temperatures are expected to fall below 60 degrees F for 24 hours after application.
- E. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

PART 2 PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

- A. Furnish materials in accordance with Greenbook Section 214 Standards.

2.2 EQUIPMENT

- A. Other Equipment:
 - 1. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

2.3 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Test and analyze traffic paints in accordance with Greenbook 214-2.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of existing conditions before starting work.
- B. Do not apply paint to concrete surfaces until concrete has cured for 28 days.

3.2 PREPARATION

- A. Maintenance and Protection of Traffic:
 - 1. Provide short term traffic control in accordance with Section 015000.
 - 2. Prevent interference with marking operations and prevent traffic on newly applied markings before markings dry.
- B. Surface Preparation.
 - 1. Clean and dry paved surface prior to painting.
 - 2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.

3.3 APPLICATION

- A. Install Work in accordance with Greenbook standards.

3.4 APPLICATION TOLERANCES

- A. Section 014000 - Quality Requirements: Tolerances.
- B. Maximum Variation from Wet Film Thickness: 1 mil.
- C. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.
- D. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F

3.5 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.
- C. Repair lines and markings, which after application and curing do not meet following criteria:
 - 1. Incorrect Location: Remove and replace incorrectly placed patterns.
 - 2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
 - 3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.
- D. Replace defective pavement markings as specified throughout the warranted period.
Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner's painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work.
- E. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original period even when replacement materials have been installed as specified.
- F. When eradication of existing paint lines is necessary, eradicate by shot blast or

water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage.

G. Maintain daily log showing work completed, results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.6 PROTECTION OF FINISHED WORK

A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

END OF SECTION 321723

SECTION 32 18 16.13

PLAYGROUND RESILIENT SURFACING

PART 1 - GENERAL

1.01 WORK SCOPE

A. Furnish labor, material, and equipment necessary to install the poured-in-place, resilient surfacing system as shown on the drawings and specified herein.

a. Work shall include, but not be limited to the following: layout; excavation; backfill; furnishing and installing of base material; furnishing and installing of poured-in-place, resilient surfacing and all other incidental work to provide a complete resilient surfacing system.

b. Poured in place playground surfacing shall consist of a polyurethane binder mixed with recycled rubber, which will make up the attenuation cushion layer. The attenuation cushion layer is capped with TPV granules, mixed with a polyurethane binder creating the Wear Course.

c. Surfaces shall comply with ADA and CPSC guidelines as well as ASTM Standards. Manufacturer is to be certified by IPEMA, a third-party testing organization for playground surfaces and equipment.

1.02 PERFORMANCE REQUIREMENTS

A. Area Safety: Poured in place within playground use zones shall meet or exceed the performance requirements of the CPSC, ADA and Fall Height Test ASTM F1292-18. The surface must yield both a peak deceleration of no more than 200 G-max and a Head Injury Criteria (HIC) value of no more than 1,000 for a head-first fall from the highest accessible portion of play equipment being installed as shown on drawings. IPEMA certification is required. (ASTM F1292-18, section 15 The laboratory test used to determine critical fall height shall have been conducted on surfacing material samples identical in design, materials, components, and thickness and manufactured as the installed playground surface).

B. Accessibility: NOTE: Children's outdoor play areas shall be in compliance with the Uniform Federal Accessibility Standards (UFAS) FED-STD-795 and the Architectural and Engineer Instructions (9AEI) Design Criteria.

C. The requirements of the Americans with Disabilities Act. Accessibility Guidelines (ADAAG) 28 CFR Part 36 that provide equal or greater accessibility than the requirements of UFAS must also be met in children's outdoor play areas.

D. Poured in place surfaces intended to serve as accessible paths of travel for persons with disabilities shall be firm, stable and slip resistant, and shall meet the requirements of ASTM F 1951-14 and ASTM F1292-18.

1.03 APPLICABLE STANDARDS

A. ASTM International

B. ASTM D2047 - Standard test method for determining the static coefficient of friction of ceramic tile and other like surfaces by the horizontal dynamometer pull meter method. This standard replaces ASTM C1028.

C. ASTM D412 – Standard test methods for vulcanized rubber and thermoplastic rubbers and thermoplastic elastomers-tension.

D. ASTM D624 - Standard test method for tear strength of conventional vulcanized rubber and thermoplastic elastomers.

E. ASTM D2859 – Standard test method for flammability of finished textile floor covering materials.

F. ASTM E303 – Standard test method for measuring surfacing frictional properties using the British Pendulum tester.

G. ASTM F1292-18 – Standard specification for impact attenuation of surface systems under and around playground equipment.

H. ASTM F1951 – Standard specification for determination of accessibility of surface systems under and around playground equipment.

1.04 Poured in place surfaces shall be manufactured and installed by trained, experienced company employees or certified installers who have successfully completed the “Certified Installers Training Program” required by Robertson Industries Inc.

1.05 SUBMITTALS: THE FOLLOWING SHALL BE SUBMITTED

A. The Contractor shall submit a complete set of the material submittals, as required, including manufacturer's name and address, specific trade names, catalog and model numbers, illustrations and descriptive material, and samples of the proposed material for this project clearly marked as to proposed items for approval by the Owner's representative.

B. Products submitted as equal must include hard copies of manufactures written specifications, warranty, purchase and use of materials.

C. Manufacturer's descriptive data and installation instructions.

D. Manufacturer's details showing depths of wear course and sub-base materials, anchoring systems and edge details.

E. Upon request, a listing of at least five installations where products similar to these proposed for use have been installed and have been in service for a minimum period of three years. The list shall include owner or purchaser, address of installation, date of installation, contact person, and phone number.

F. A signed statement by an authorized official certifying that the surfacing system meets the requirements of ASTM F1292-18, section 15 for a head-first fall from the highest accessible portion of the specified playground equipment.

G. A signed statement from the manufacturer of the poured in place surfacing attesting that all materials under this section shall be installed only by the Manufacturer's Trained Installers.

H. A Certificate of Insurance shall be provided by the Manufacturer for poured in place surfacing for use as playground safety surfacing, covering general and product liability, of not less than \$1,000,000 for each occurrence, \$2,000,000 general aggregate, with an excess/umbrella liability of \$25,000,000. The issuing underwrite shall be AA rated.

I. IPEMA Certification mandatory

1.06 Delivery, Storage and Handling: Materials and equipment shall be delivered and stored in accordance with the manufacturer's recommendations.

1.07 Project Site Conditions: Poured in Place surfacing must be installed on a dry sub-surface, with no prospect of rain within the initial drying period, and within the recommend temperature range of the manufacturer. Installation in weather condition of extreme heat, cold (less than 55°F), and/or high humidity may affect cure time, and the structural integrity of the final product. Immediate surrounding sites must be reasonably free of dust conditions or this could affect the final surface look.

1.08 Sequencing and Scheduling: Poured in Place surfacing shall be installed after all playground equipment, shade structures, signs and any other items that will be within the surfacing area. Coordinate with General Contractor.

1.09 Surface installation coordinated by manufacturer representative.

1.10 Warranty: Poured in Place surface shall maintain required impact attenuation characteristics and be guaranteed against defects in workmanship AND material for a limited seven-year period or as specified and agreed upon per alternate contract. Warranty will be specific to maintenance requirements and performance standards of completed product. Warranty is void if not installed by Manufacturers Trained and Certified Poured in Place Surfacing Installers.

1.11 Testing: NOTE: Critical Fall Height Four feet through 10 feet have been tested in accordance with Section 15 – Critical Fall Height Test Procedure of ASTM F1292-18.

PART 2 – PRODUCTS

2.01 SAFETY

A. Safety surfacing shall consist of both recycled and synthetic materials meeting the requirements of this specification. The type of safety surfacing shall be Robertson Industries Inc., manufactured and installed by Robertson Industries Inc., or it's Certified Installers. Telephone: (800) 858-0519.

2.02 PRODUCT SCOPE

A. Poured in Place Surface: The poured in place surface shall consist of recycled rubber mixed with a polyurethane binder, then capped with .5-1.5mm TPV granules mixed with an aliphatic binder.

B. It shall consist of a uniform material manufactured in such a way that the top portion meets the requirements specified herein for wear surface.

C. The type of safety surfacing shall be a poured-in-place system and shall be indicated on the drawings.

2.03 ATTENUATION CUSHION LAYER SECTION

A. Impact attenuation cushion layer consists of these materials; recycled styrene butadiene rubber (SBR) and/or cryogenic crumb rubber and/or pre consumer postindustrial reclaimed scrap rubber adhered with a 100% solids polyurethane binder to form a resilient porous material.

B. Strands of SBR may vary from 0.5 mm – 2.0 mm in thickness by 3.0 mm – 20 mm in length.

C. Chunk Premium Black Rubber Granules are 5/8" granules: This rubber is pre-consumer, post-industrial, reclaimed rubber, granulated through a 5/8" screen and contains less than 2% dust.

D. SBR Crumb Rubber (5-9 Mesh) using sieve analysis ASTM D5644 with a fiber content of .1% or less mixed in.

E. Binder shall be between 7-12% of the total weight of the material and shall provide 100% coating of the particles.

F. The attenuation cushion layer shall be compatible with the wear course and must meet requirements herein for impact attenuation.

2.04 WEAR COURSE

A. Wear course shall consist of .5-1.5mm Thermal Plastic Vulcanized (TPV) granules with polyurethane binder formulated to produce an even, uniform, seamless surface. Installation of surfacing shall be seamless (unless otherwise agreed upon by owner).

B. TPV shall be peroxide cured with an TPV content of 26% and shall include a processing aid to prevent hardness with 26% poly content to maintain dynamic testing characteristics, weatherization and UV stability. C. ASTM D2240 (Shore A) hardness of 55-65, not less than 26 percent rubber hydrocarbons.

D. Size of TPV granules .5-1.5mm across. Binder shall be not less than 20% of total weight of rubber used in the wear surface and shall provide 100% coating of the particles.

E. Thickness of wear course shall be a minimum .5" (12.7 mm).

F. The wear course shall be porous.

2.05 BINDER

A. No Toluene Diphenyl Isocyanate (TDI) shall be used.

B. No filler materials shall be used in urethane such as plasticizers and the catalyzing agent shall contain no heavy metals.

C. Weight of polyurethane shall be no less than 8.5 lbs. /gal (1.02 Kg/1) and no more than 9.5 lbs. /gal (1.14 Kg/1).

D. Manufacturer is permitted to modify the type of urethane required to match extreme weather conditions. Substitutions must be equal to or exceed original quality.

2.06 MATERIALS

A. Location Used: Playground Area

B. Wear Course – TPV Granules Manufacturers: Rosehill Polymers As Distributed by: Robertson Industries Inc. (800) 858-0519

C. Attenuation cushion layer – Manufacturers: Robertson Industries Inc. Shredded and/or Chunk Rubber As Distributed by: Robertson Industries Inc. (800) 858-0519

D. Binder – Aliphatic Urethane Premium, Non-Ambering - Manufacturer: Accella Polyurethane Systems As Distributed by: Robertson Industries Inc. (800) 858-0519

E. Chunk Premium Black Rubber Granules - Manufacturer: American Recycling Center, Inc. (989) 725-5100, 655 Wabasse Drive Owosso, MI 48867, As Distributed by: Robertson Industries Inc. (800) 858-0519

PART 3 – EXECUTION

3.01 SITE PREPARATION

A. Finished Grade/Slope: Verify that finished elevations or adjacent areas are as indicated on the architectural or site plans, that the appropriate sub-grade elevation has been established for the safety surface to be installed, and that the subsurface has been installed per architectural, site or equipment plans while meeting accessibility and use zones requirements.

B. Aggregate Subbase: Tolerance of aggregate sub-base shall be within .5" in depth. Verify that aggregate sub-base has been fully compacted. Per ADA Guidelines: compacted Aggregate sub-base – 4" of .75" minus irregular stone with fines compacted to 95% in 2" watered lifts.

C. Concrete Sub-Base: Tolerance of concrete or bituminous sub-base shall be with .125" (3.0 mm) in 10' (3050 mm). Per ADA Guidelines: Concrete a minimum of 3' – 4' at a minimum 2500 PSI. Concrete must cure for 7 days prior to application of attenuation cushion layer. Concrete must cure 21 days if wear course is to be applied directly to concrete surface. If poured in place surfacing is installed, verify that the concrete sub-base has cured (all areas appear white in color usually at 7 days) and that all concrete curing compounds and other deleterious substances that might adversely affect adhesion have been removed. Surface shall be clean and dry.

D. Asphalt Sub-Base: Asphalt cure time requires 21-28 days. Once the new asphalt has cured, it must be pressure washed prior to the surfacing being installed. The contractor shall be responsible for flooding the

pad to ensure proper slope and tolerance. Any areas holding enough water to cover a flat nickel shall be patched prior to the arrival of our installation crews.

E. Drainage: Verify that sub-surfacing drainage, if required, has been installed to provide positive drainage.

3.02 INSTALLATION

A. Poured in Place Surfacing: Components of the poured in place surfacing shall be mixed on site in a rotating tumbler to ensure components are thoroughly mixed and are in accordance with manufactures recommendations. Installation of surfacing shall be seamless up to 2,000 square feet per day. Material shall cover all foundations and fill around all elements penetrating the surface.

B. Attenuation Cushion Layer: Whenever practical, attenuation cushion layer of surfacing material shall be installed in one continuous pour on the same day of up to 2,000 square feet. When a second pour is required, step the seam (see detail) and fully coat the step of the previous work with polyurethane binder to ensure 100% bond with new work. Apply adhesive in small quantities so that new attenuation cushion layer can be placed before the adhesive dries.

C. Wear Course: Wear course must be quality peroxide cured TPV granules. wear surface shall be bonded to attenuation cushion layer. If necessary, additional primer will be used between the attenuation cushion layer and wear course. Apply adhesive to attenuation cushion layer in small quantities allowing the wear course to be applied before adhesive dries. Surface shall be hand troweled to a smooth, even finish. Expect continuous and seamless up to 2,000 square feet per day (contact sales representative for seamless in excess of 2,000 square feet). Where seams are required due to color change, size or adverse weather, a step configuration will be constructed to maintain wear course integrity. The edge of initial pour shall be coated with adhesive and wearing surface mixture shall be immediately applied. Pads with multiple seams are encouraged to include a top coat of urethane before being placed into use. Butt joint seams are not acceptable except for repairs. Under special conditions and with Owners written approval seams may be permitted in same color pad. Consult with Manufacturer for specific applications.

D. Perimeter: For installations over existing concrete, the perimeter shall be saw cut to provide a keyway 1" deep x 1" wide, or formed during the pour, with surfacing rolled down into the void. Primer adhesive must be applied to all sides of the void. When connecting to a concrete curb or border, the inside vertical edge shall be primed with adhesive and the final 2" of the attenuation cushion layer shall be tapered to allow the wear surface material to be 1.5"– 2" thick where it joins the concrete.

E. Asphalt: When installing over new asphalt, a curb or other type of border is recommended around the entire pad to separate the new surface from other ground materials. Primer adhesive must be applied to the inside vertical edge of the border before poured in place surface installation.

F. Asphalt: When installing over existing asphalt, a key way cut of 1" deep by 1" side for the poured in place to taper into and terminate with required ADA slope.

G. Thickness: Construction methods such as the use of measured screeds or guides shall be employed to ensure that the full depth of specified surfacing material is installed. Surfacing system thickness throughout the playground equipment use zone shall be as required to meet the impact attenuation requirements specified herein.

H. Clean Up: Manufacturer installers shall work to minimize excessive adhesive on adjacent surfaces or play equipment. Spills of excess adhesive shall be promptly cleaned.

I. Protection: The safety surface shall be allowed to fully cure in accordance with Manufacturer's instructions. The surface shall be protected by the owner from all traffic during the curing period of at a minimum of 48 hours or as instructed by the Manufacturer.

J. Manufacturer Services: For poured in place safety surfacing, a Manufacturer's representative who is experienced in the installation of playground safety surfacing shall be provided. The representative shall supervise the installation to ensure that the system meets the impact attenuation requirements as specified herein.

3.03 SITE AREA CLEAN UP

The site shall be kept clean and free of tools, trash, and debris and installation materials daily. Products may be stored on site during installation with appropriate protective measures and approval by the Owner's representative.

END OF SECTION

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SECTION 32 31 11
AUTOMATIC GATE OPERATORS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Gates, posts and rollers, sliding gate operators, controls, vehicle presence sensors, and key boxes for official access keys as shown on drawings and as specified herein.

1.03 RELATED SECTIONS

- A. Section 28 10 00 - Access Control
- B. Section 32 31 19 - Louvered Fences and Gates
- C. Division 26 – Electrical.

1.04 SUBMITTALS

- A. Submit shop drawings showing each of the items to be provided under this section. Shop drawings shall indicate installation and assembly conditions, wiring diagrams, components, anchorage, materials, and finishes. Coordinate wiring diagram with electrical drawings.
 - 1. Submit separate drawings for each unique site condition. Drawings shall clearly delineate all required components of the operator system.
- B. Submit manufacturer's instructions for installation.
- C. Submit manufacturer's data for each of the specified products.
- D. Submit certificates from manufacturer stating that automatic gate operators conform to the specified requirements.
- E. Submit manufacturer's parts list and maintenance instructions for each type of operator.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from moisture as recommended by the manufacturer.

1.06 WARRANTY

- A. Provide a full five year manufacturer's warranty on all components of gate operator system.
- B. Provide a one year maintenance agreement to inspect, maintain, repair and replace all gate operator parts.

PART 2 – PRODUCTS

2.01 AUTOMATIC GATE OPERATORS

- A. High Traffic Commercial Rolling Gate Operator, CSL24UL, by Liftmaster, Larko, or equal.
- B. Electrically Controlled Gate:
 - 1. Provide rolling gate operators for the sizes and shapes indicated in the drawings and as specified in Section 32 31 19 - Decorative Metal Fences and Gates.
 - 2. Provide rolling gate with an opener, a controlled electrical motor assembly, with motor size and reduction ratio as required for the size and weight of the gate.
 - 3. Provide a keypad and card access controller to activate openers.
 - 4. Gate opener assembly shall carry UL certification.
 - 5. All components of the gate opening assembly shall be from the same manufacturer.

2.02 OPERATOR UNIT

- A. Provide for manual operation in event of power failure.

- B. Power requirements: 120 volt, 60 hertz, single phase power (20 amp).
- C. Gate operator: motor shall be 1/2 HP minimum. Housing shall be 11 gauge, painted galvanized steel.
- D. Operators shall have:
 - 1. 1/2 HP capacitor run motor.
 - 2. Planetary gear reducer.
 - 3. Adjustable torque limiter.
 - 4. Lockable quick disconnect arm for manual gate operation in case of power failure.
 - 5. 2-1/2 inch diameter output shaft.
- E. Gate speed shall be a minimum of 70 feet per minute.

2.03 CARD READER CONTROL UNIT

- A. Keypad Gate Controller:
 - 1. Control unit shall be push button key pad programmable with multiple four digit codes.
 - 2. "AdvantageDKLP Digital Keypad Low Power" by American Access Systems, or approved equal.
 - 3. Key pad shall have an audible tone when pad is depressed. Provide with LED indicators.
- B. Key Switch: Provide Knox Gate and Key switch 3500_S, single lock on plate style, or equal per City of Santee standards.
- C. Unit shall be post mounted. Units shall be located as indicated in the drawings.

2.04 VEHICLE DETECTOR LOOP:

- A. Loop system including automatic closing timer with adjustable time delay before closing and
 - 1. timer cut off switch; designed to hold gate open until traffic clears. Loops shall have sufficient
 - 2. sensitivity to be triggered by motorcycles.
- B. Emergency Strobe with required photo eye: FireStrobe 2000 rapid access gate opener, or
 - 1. equal. Provide power as required to operate unit.

2.05 MISCELLANEOUS EQUIPMENT

- A. Emergency Strobe: FireStrobe 2000 rapid access gate opener, or equal. Provide power as required to operate unit.
- B. Automatic Reversing Control Photo Eye: Provide electric eye sensing system that will stop the gate if there are any obstructions in the way of the door travel.
- C. Vehicle Presence Sensor Photo Eyes: Manufactured by Optex America, or equal.
 - 1. Provide vehicle presence sensor for safety to prevent gate closing on autos in opening and exiting.

2.06 SEQUENCE OF OPERATION

- A. Parking Area: Provide all accessories required for the sequence of operation as follows:
 - 1. To Enter:
 - a. Activate keypad access control system located on post assembly to open gate. Gate shall close automatically after vehicle has cleared vehicle presence sensor on the inside of the gate.
 - b. Activate gate operator by operation strobe mounted on Fire Apparatus to open gate. Gate shall close automatically after apparatus has cleared vehicle presence sensor on the inside of the gate.
 - c. Activate gate operator by remote control operator to open gate. Gate shall close automatically after vehicle has cleared vehicle presence sensor on the inside of the gate.
 - 2. To Exit:

- a. Gate shall open automatically after vehicle has entered the detection zone of the vehicle presence sensor on the inside of the gate and shall close again automatically after vehicle has cleared the vehicle presence sensor.

2.07 POST FOUNDATION

- A. Concrete to meet requirements of ASTM C94.
 - 1. 3/4-inch aggregate, minimum compressive strength of 2,500 PSI at 28 days.

PART 3 – EXECUTION

3.01 CONSTRUCTION

- A. Inspect adjacent and related work in the vicinity.
- B. Starting work of this section means acceptance of site conditions.

3.02 INSTALLATION

- A. Install automatic gate operator and accessories in accordance with shop drawings and manufacturer's instructions. Connect low voltage control wiring. Provide all power required for operation of gate and accessories.
- B. Coordinate installation of components with other contractors and adjacent work.
- C. Adjust automatic gate equipment for correct function and smooth operation.
- D. Provide concrete level pads of size per manufacturer's recommendations, 2 inches above highest adjacent grade or curb and minimum 18 inches into compacted soil.

3.03 WRENCHES AND TOOLS

- A. Provide Manufacturer's wrenches and tools required for maintenance of equipment.

END OF SECTION

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SECTION 32 31 19
LOUVERED FENCE AND GATES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Aluminum Fixed Louver Modular Fencing Panels:
 - 1. Fabricated with extruded aluminum louvers and flat aluminum bars including extruded aluminum fence posts and aluminum louver gates.
 - 2. Louvered security fence and gates shall be furnished and installed as shown on the plans and specified herein.

1.02 REQUIREMENTS

- A. Furnish materials, labor, expertise and equipment necessary to complete all work specified in this section and as shown on the drawings.
- B. Structural Performance: Provide product and installation capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform pressure of 30 lbs/sq. ft. acting inward or outward.
 - 2. Thermal Movements resulting from a temperature change (range) of 120 degrees Fahrenheit ambient and 180 degrees Fahrenheit material surfaces.

1.03 SUBMITTALS

- A. Shop drawings and manufacturer's literature: Provide specifications and construction detail drawings to substantiate quality of materials and provide details of fabrication and installation.
- B. Submittals shall be in accordance with standard construction practices to include complete detailed layout of all panels, posts, gates. Submittals shall include plan layout, elevations and section views of panels, posts and gates.
- C. Certificate: Manufacturer's certification that materials meet specification requirements.

1.04 REFERENCES

- A. ASTM B209/B209M – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
- C. ASTM D3363 – Standard Test Method for Film Hardness by Pencil Test.
- D. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation.
- E. ASTM B117 – Standard Practice for Operating Salt Spray Apparatus.
- F. ASTM D822/D822M – Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- G. AWS D1.2/D1.2M - Structural Welding Code – Aluminum.

1.05 QUALITY ASSURANCE

- A. Installation of fence and materials shall conform to the requirements of the Manufacturer.

1.06 WARRANTIES

- A. The fence shall be warranted from any defects for a period of 20 years for materials and 5 years for installation.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Louvered security fence:

1. Approved Louvered Fence System, Manufacturer: PalmSHIELD, www.palmshieldlouvers.com.
 - a. "Palm Shield", American Fence Company
 2. Material Descriptions:
 - a. Extruded Aluminum: ASTM B221, Alloy 6063 – Temper T-6.
 - b. Sheet Aluminum: ASTM B211, Alloy 6063 – Temper T6.
 - c. Powder Coating Material Hardness: ASTM 3363 2H.
 3. Louver Panel Description:
 - a. Louver Panel Height: per the drawings.
 - b. Louver Panel Width: Not to exceed 6'.
 - c. Louver fencing system consisting of horizontal, fixed louver, modular fence panels fabricated with extruded aluminum framing bars and supported by extruded aluminum fence posts.
 - d. Extended Flange to allow for a minimum of ½ inch overlap of louvers for 100% direct visual screening.
 - e. Fixed Louver Bars: 0.1250 inch thick louver with an installed profile of 2 inch X 2.873 inch tall.
 - f. Vertical Framework: PalmSHIELD exclusive 4" wide x 2" deep x 1/8" tapered aluminum channel.
 - g. Horizontal Top Cap: 4" x 3" x 1/8" aluminum channel.
 - h. Horizontal Bottom Cap: 4 inch x 3 inch x 1/8" aluminum channel.
 - i. Cross Bar: 1 inch x 1/8 inch aluminum flat bar.
 4. Fence Posts:
 - a. Panel posts shall be 4 inch deep x 3" wide I-Beam Post extruded tubular aluminum sections with solid aluminum caps. Length as specified on the drawings.
 - 1) 5/16" double walled webbing with 5/8" wide cavity.
 - 2) 5/16 flanges
 - 3) Inner flange mechanically fastened to webbing with 3/8" stainless steel fastener.
 - 4) Outer flange and webbing form one extrusion.
 - (a) On center post spacing shall be as specified by manufacturer.
 - (b) All fence posts to be plated with 10" x 10" x 3/4" aluminum plates with four 3/4" hole for anchors.
 5. Fittings and accessories: All fittings and accessories shall be stainless steel and sized as specified by the fence manufacturer. Fence panels to be attached to posts with ¼" x 1" stainless steel screws. Panels and posts are predrilled to support level installation.
 6. Anchor Bolts: Anchor bolts shall be adequate to support loads based on screening height, exposures and loading.
- B. Gates: Swing and size as shown on the drawings.
1. Louver spacing, style and appearance shall be identical to fence panels.
 2. Gate hinges to be Gorilla barrel hinge with ¾" rod, ball bearing, and grease zert. Hinge plate to be ½" thick plates offset to create a 5/8" gap. Standard hardware as required by the gate manufacturer for complete functional operation. Hinges to be bolted to gate frame and field welded to steel gate posts.
 3. Gate latch to be internal lock with exterior grab handles.
 - a. Lock to be coordinated with Access Control system.
 4. Welded frame, size as shown on the contract drawings, extruded aluminum tubing with aluminum fixed louver panels to match fencing material.
 5. Drop rods to be 1" schedule 40 pipe and through-bolted to gate frame.
 6. Hardware: Size and type as determined by the manufacturer. Provide three hinges per leaf.
 - a. Provide 1 inch diameter center cane bolt assembly and strike, each door.
 - b. Provide padlockable slide bolt assembly.

7. Gate shall have welded frame fabricated from extruded aluminum tubing with aluminum fixed louver panels to match fencing material. Frame configurations shall be as indicated on the contract drawings.
8. Gate posts shall be as determined by manufacture. Gate posts to be specified to support gates.
9. Factory Finish: Aluminum fence panels, posts and gates shall receive polyester powder coating.
 - a. Polyester powder coating: Electrostatically applied colored polyester powder coating heat cured to chemically bond finish to metal substrate.
 - b. Color shall be as selected by Architect.
 - c. Minimum hardness measured in accordance with ASTM D3363 2H.
 - d. Direct impact resistance tested in accordance with ASTM D2794. Withstand 160 inch-pounds.
 - e. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95° F and 95% relative humidity after 1,000 hours, less than 3/16 inches undercutting.
 - f. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted 45°.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Do not commence work until unsatisfactory conditions have been corrected.
- B. Verify that final grading in fence location is completed and without irregularities which will interfere with fence installation. Variations in height, slopes, stairs shall be shown on contract drawings and on submittal drawings.
- C. Field verify all fence dimensions and layout prior to commencing installation.

3.02 INSTALLATION

- A. Install fence in accordance with manufacturer's installation instructions.
- B. Install fence plumb and level. Posts are plated and mounted to top of surface.
- C. Do not install bent, bowed or otherwise damaged panels. Remove damaged components from site and replace.
- D. Secure fence panels with stainless with ¼" x 1" stainless steel screws to fence posts. All posts and panels will be predrilled to support level installation.

3.03 GATES

- A. Install gates and adjust hardware for smooth operation.

END OF SECTION

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**SECTION 32 33 00
SITE FURNISHINGS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Division 01 General Requirements apply to the Work of this Section.
- B. Section 32 90 00 Landscaping

1.02 DESCRIPTION

- A. Work includes but is not limited to the following:
 - 1. Furnish all labor, materials, tools, equipment, operation or methods listed, mentioned or scheduled on Drawings and/or herein specified in this Section.
 - 2. Although such Work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 - 3. Completely coordinate with Work of all other trades.

1.03 QUALITY ASSURANCE

- A. All products or items described herein shall be new, unless otherwise specified, and shall be from the specified manufacturer or approved equal. Products shall be complete in all respects, properly installed, and in perfect working order.

1.04 QUALIFICATION OF INSTALLER

- A. Installer shall be thoroughly trained and experienced in the skills required, and shall be completely familiar with the products and their installation as specified on Landscape Planting Plan and in this Section. Installer shall be present at all times during progress of Work of this Section and shall direct all Work performed.

1.05 COORDINATION

- A. Contractor shall be charged with the responsibility of making arrangements for the coordination of his construction operations with those of all others on the job, and he shall permit other forces so engaged to accomplish their portion of the Work without undue interference or delay.
- B. Contractor shall place order for all site furnishings and equipment immediately after award of bid to ensure adequate time for manufacturing, shipping and installation. If any materials or equipment are not ordered in time, additional costs made by equipment manufacturer's to their equipment in time to meet construction schedule together with any special handling costs, shall be borne by the Contractor. NO project extension shall be granted due to improper lead time in ordering.

1.06 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Samples of each type of product with color charts.

1.07 INFORMATIONAL SUBMITTALS

- A. Submit six (6) copies of manufacturer's catalog cuts off all products for City approval. Catalog cuts shall clearly identify product, finishes, color, schedule and installation.
- B. Manufacturer's specifications and other data needed to prove compliance with the specified products.
- C. Maintenance Data.

PART 2 PRODUCTS

2.01 TRASH RECEPTACLES

- A. Products: Subject to compliance with requirements, provide all trash receptacles from one of the following:

1. Victor Stanley, Inc.: Model SD-242, Ironsites Series.
 2. Petersen Manufacturing Co.
 3. Or equal.
- B. Description: Standard 36 gallon trash receptacle.
1. Material: 3/8" x 1" vertical solid steel bar; 1/4" x 2-1/2" horizontal solid steel bands; 3/8" x 3" steel support bars; 5/8" solid steel top ring; leveling feet with a 3/8" (9.53mm) diameter threaded steel shafts, side opening.
 2. One tapered formed lid and one recycle lid.
 3. Standard reinforced, ribbed interior plastic liner.
 4. Fabricated metal components phosphatized and electrostatically powder coated.
 5. Color: Standard – provide options to Architect
 6. Freestanding.

2.02 BIKE RACK

- A. Products: Subject to compliance with requirements, provide all bike racks from one of the following:
1. Victor Stanley, Inc.: Cycle Sentry Collection, Model BRCS-105 (Basis of Design).
 2. Petersen Manufacturing Co.
 3. Or equal.

2.03 BENCH

- A. Products: Basis of Design, Sitescapes: Avondale w/ Steel Bar Ends Model No. AV1-1000

2.04 SUBSTITUTIONS

- A. Per the provisions of Section 01 25 00 Substitution Procedures.

PART 3 EXECUTION

3.01 GENERAL

- A. Adequately protect all work from damage by subsequent construction operations. Damaged work shall be replaced by Contractor and at Contractor's expense.
- B. Work shall be set true to line and shall present a neat and finished appearance. Include setting each item in its correct place, securely fastening it, connecting it, or incorporating it into other portions of the work, as each item may require; and testing and operating equipment to assure proper functioning. Furnish anchors and adhesives required for securely installing and attaching the equipment specified herein.
- C. Install per manufacturer's drawings, details and specifications.

END OF SECTION

SECTION 32 39 13
MANUFACTURED METAL BOLLARDS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Fixed Steel Bollards
 - 2. Removeable Steel Bollards

1.02 SUBMITTALS

- A. General Requirements: Refer to Division 1

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 years of experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 years of experience installing similar products.

1.04 STORAGE AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.

1.05 PROJECT CONDITIONS

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

PART 2 PRODUCTS

2.01 FIXED BOLLARDS

- A. 4" Carbon Steel Bollard.
 - 1. Material PCS04040 SCh 40 ASTM A-53 Carbon Steel
 - 2. Dome Cap
 - 3. Diameter: 4.5"
 - 4. Height: 30"
 - 5. Embed Depth: 27"

2.02 REMOVEABLE BOLLARDS

- A. 4" Padlock Removable Carbon Steel Bollard.
 - 1. Material PCS04040 SCh 40 ASTM A-53 Carbon Steel
 - 2. Dome Cap
 - 3. Diameter: 4.5"
 - 4. Height: 30"
 - 5. Embed Depth: 27"
 - 6. 4" Embedment Sleeve 12" Depth
 - a. Embed Sleeve Diameter 8.75" when closed.

2.03 MANUFACTURER

- A. 1-800-BOLLARDS: 43171 Business Park Drive, Temecula, CA 92590-3628,
info@1800bollards.com

2.04 SUBSTITUTIONS

- A. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00
- Substitution Procedures.

PART 3: EXECUTION

Issued for Construction
Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/2026
MANUFACTURED METAL
BOLLARDS
32 39 13 -1

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Before proceeding with work, notify the Owner's Designated Representative in writing of unsuitable conditions and conflicts.

3.02 INSTALLATION

- A. Comply with manufacturer's recommendations for installation.

END OF SECTION

SECTION 32 80 00

IRRIGATION

PART 1 - GENERAL

1.00 SUMMARY

Work includes but is not necessarily limited to demolition and removal and / or restoration of existing irrigation and installation of new irrigation.

A. Related work in other sections(including but not limited to:

1. Trenching, backfilling
2. Project close-out (record "as-built" drawings).
3. Selective demolition
4. Plumbing
5. Electrical
6. Landscaping

B. Related Documents:

1. Drawings and General Provisions of the Contract, Including General and Supplementary Conditions and Division 01 Specifications, apply to this Section.
2. Landscaping- 32 90 00

1.01 REFERENCES:

A. Refer to Section 01090 for information concerning availability and use of references.

ANSI B16.18-84 - Cast Copper Alloy Solder Joint Pressure Fittings

ANSI/ASME A112.26.1M-84 - Water Hammer Arresters

ANSI/ASME B16.3-85 - Malleable Iron Threaded Fittings

ANSI/ASME B16.15-85 - Cast Bronze Threaded Fittings Classes 125 and 250

ASSE 1020-81 - Vacuum Breakers, Anti-Siphon, Pressure Type

ASTM A 53-90b - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM B 43-91 Seamless Red Brass Pipe, Standard Sizes

ASTM D 1784-91 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D 2241-89 Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

ASTM D 2464-91 - Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D 2466-90a - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D 2564-91a - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping System

ASTM D 2774-72 - Underground Installation of Thermoplastic Pressure Piping

ASTM D 2855-90 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

ASTM F 441-89 - Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

AWWA C500-86 - Gate Valves for Water and Sewerage Systems

AWWA C511-89 - Reduced-Pressure Principle Backflow-Prevention Assembly

AWWA C651-86 - Disinfecting Water Mains

FCCCHR-USC-92 - List of Approved Backflow Prevention Assemblies

FS 0-F-506C - Flux, Soldering: Paste and Liquid

MSS SP-80-87 Bronze Gate, Globe, Angle and Check Valves

MSS SP-85-85 - Cast Iron Globe & Angle Valves Flanged and Threaded Ends

NEMA ICS 2-88 - Industrial Control Devices, Controllers and Assemblies

NEMA ICS 6-88 (Rev. 1) - Enclosures for Industrial Control and Systems

NFPA 70-93 - National Electrical Code

NSF 14-90 - Plastic Piping Components and Related Materials

PPI TN8/8-73 - Making Threaded Joints with Thermoplastic Pipe & Fittings

UL 651-89 - Schedule 40 and 80 Rigid PVC Conduit

1.02 DESCRIPTION

- A. Work included: All service, labor, materials, transportation and equipment necessary to perform the work indicated on the Drawings and as specified.

1. Explanation of Drawings:

- a. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally

diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, site utilities and architectural features.

- b. All work called for in the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.
- c. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that unknown obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Owner's Representative. In the event this notification is performed, the irrigation contractor shall assume full responsibility for any revision necessary and shall perform such revisions at his own expense.

1.03 SUBMITTALS

A. Submittals:

- 1. Furnish a certificate of Full Approval or a current Certificate of Approval from FCCCHR-USC for size and make of backflow preventer for this project. A Certificate of Provisional Approval will not be acceptable.
- 2. Material List:
 - a. The Contractor shall furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Owner's Representative.
 - b. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
 - c. Equipment or materials installed or furnished without prior approval of the Owner's Representative may be rejected and the Contractor required to remove such materials from the site at his own expense.
 - d. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.
 - e. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.
- 3. Record and As-Built Drawings:
 - a. The Contractor shall provide and keep up to date a complete "as built" record set of bond prints which shall be corrected daily and show every change from the original drawings and specifications and the exact "as built" locations, sizes, and kinds of equipment. This set of drawings shall be kept on the site and shall be used only as a record set.

- b. These drawings shall also serve as work progress sheets, and the Contractor shall make neat and legible annotations thereon daily as the work proceeds, showing the work as actually installed. These drawings shall be available at all times for review.
 - c. Contractor shall provide Owner's Representative with a record set of drawings prior to beginning maintenance period.
 - d. Contractor shall dimension from two (2) permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following items. Dimensions and notes shall be legible.:
 - 1) Routing of sprinkler pressure lines (dimension max 100' along routing) including offset dimension from fixed site elements.
 - 2) Sprinkler control valves and mainline isolation and shutoff valves.
 - 3) Quick coupling valves.
 - 4) Irrigation point of connection equipment including backflow preventer, submeter, flow meter, master valve and pressure regulator.
 - 5) Location of irrigation meter and service line.
 - 6) Significant changes in routing of lateral lines from those indicated on the plans.
 - 7) Exact location and depth of sleeves and conduit for piping and wiring under paving.
 - 8) Changes to valve numbering system.
 - e. The Contractor shall deliver the corrected and completed bond prints to the Owner's representative prior to receiving authorization to begin the landscape maintenance period. Delivery of the bond prints will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints.
 - f. The approved redline as-builts shall be scanned in color full size and a digital pdf provided to the Owner's Representative.
4. Operation and Maintenance Manuals:
- a. Prepare and deliver to the Owner within ten calendar days prior to completion of construction, two hard cover binders with three rings containing the following information:
 - 1) Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representatives.
 - 2) Catalog and parts sheets on every material and equipment installed under this contract.

- 3) Guarantee statement.
 - 4) Complete operating and maintenance instructions on all major equipment.
 - b. In addition to the above mentioned maintenance manuals, provide the Owner's maintenance personnel with instructions for major equipment and show evidence in writing to the Owner at the conclusion of the project that this service has been rendered.
5. Equipment to be Furnished :
- a. Supply as a part of this contract the following tools:
 - 1) Two (2) sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this project.
 - 2) Two (2) keys for each automatic controller /enclosure(not applicable)
 - 3) One (1) quick coupler key and matching hose swivel for every five (5) of each type of quick coupling valve installed.
 - b. The above mentioned equipment shall be turned over to the Owner at the conclusion of the project. Before final observation can occur, evidence that the Owner has received material must be shown to the Owner's Representative.

1.04 GUARANTEE

- A. The general conditions and supplementary conditions of these Specifications shall be filed with the Owner or his representative prior to acceptance of the irrigation system.
- B. A copy of the guarantee form shall be included in the Operations and Maintenance Manual.
- C. The guarantee form shall be retyped onto the Contractor's letterhead and contain the following information

GUARANTEE FOR IRRIGATION SYSTEM

We hereby guarantee that the irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the Drawings and Specifications, ordinary wear and tear and unusual abuse, or neglect expected. We agree to repair or replace all defects in material or workmanship which may develop during the period of one year from date of acceptance and also to repair or replace all damage resulting from the repair of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said

repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT:

LOCATION:

CONTRACTOR/COMPANY:

LICENSE NO:

ADDRESS:

PHONE:

DATE OF FINAL ACCEPTANCE:

SIGNED:

DATE:

1.05 OBSERVATION

A. Observation Schedule

1. The Contractor shall be responsible for notifying the Owner's Representative as necessary for inspections.
 - a. Pre-job conference - 5 working days
 - b. Trenching - 5 working days
 - c. Pressure supply line installation and testing - 5 working days
 - d. Lateral line and electrical valves - 5 working days
 - e. Coverage tests – 5 working days
 - f. Pre-maintenance and final observation - 5 working days
2. No work shall be backfilled until appropriate observations and testing have been completed and approved by the Owner's Representative, City of Newport Beach Landscape Inspector and governing agency representative(s).
3. The Contractor will be back charged for any time and mileage used by the Owner's Representative as a result of a prematurely scheduled site visit.
4. A final site observation visit and performance test by the Owner's representative shall be at the same time as the final site observation of the specified plant establishment period.
5. In addition to the above noted observations the Contractor shall comply with all governing agencies' regulations for installation and inspection. Contractor is

solely responsible for coordinating the necessary inspections required by the governing agencies.

1.06 TESTING

A. Field Quality Control

1. Testing of Irrigation System

- a. Prior to the system being pressure tested and before the installation of any terminal fittings the entire pipeline system shall be thoroughly flushed to remove dirt, scale and or other material.
- b. Test all pressure lines under hydrostatic pressure of 125 pounds per square inch, and prove watertight 4 hours or as required by governing agency specifications.
- c. Testing of pressure main lines shall occur after installation of control valves, pressure regulators, backflow preventers and y-strainers. Control valves to laterals shall be closed during testing of mainlines.
- d. A sprinkler coverage test shall performed after the sprinkler heads are installed and shall demonstrate that each section or unit is balanced to provide uniform and adequate coverage of the areas serviced. Any necessary adjustments shall be made as noted in Section 1.06-2.
- e. The drip system components shall be tested and flushed per the manufacturer's specifications. Pressure shall be regulated at the valve assembly to optimize flow for each system. Additional check valves, flush valves etc. may need to be added to the individual systems to optimize operation of drip systems based on actual site conditions.
- f. Recommended Dripline and Emitter Lateral Flushing Procedures.
 - 1) Flush the system every two weeks for the first six (6) weeks and check the water that is flushed out for cleanliness. Establish a regular system flushing schedule for the future based on results from the initial six-week flushing schedule.
 - 2) Flush the system completely after any repairs are made and monitor system operation closely under regular system flushing schedule.
 - 3) Check the pressure at the supply and flush headers on a regular basis and compare with the pressure readings taken after installation.
- g. Recommended Dripline and Emitter Lateral Leakage Testing Procedures:

- 1) Subject installed dripline tubing and emitter lateral piping to water pressure equal to specified operating pressure for ten (10) minutes. Test with control zone components and dripline flush valve components installed.
- 2) Partially backfill buried pipe and tubing to prevent movement under pressure. Expose couplings, fittings, and valve components.
- 3) Visually inspect valve assemblies and fittings for leakage and replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until test segment is free from leaks. Cement or caulking to seal leaks is prohibited.

2. Adjustment of the System

- a. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent over-spray onto walks, roadways, and buildings as much as possible.
- b. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required and installation of pressure compensating devices as may be required by site conditions and the specific irrigation component.
- c. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans.
- d. Review growth of planting in dripline areas-adjust schedule / run time and if necessary move or add dripline.
- d. Program controllers.
- e. Test and adjust of all peripheral control components including, but not limited to master valve, flow sensor/meter, rain sensor.
- f. Adjust individual remote control valves/drip valve assemblies.

1.07 GENERAL REQUIREMENTS

- A. Code Requirements shall be those of State and Municipal Codes and Regulations locally governing this work, providing that any requirements of the Drawings and Specifications, not conflicting therewith but exceeding the Code Requirements shall govern, unless written permission to the contrary is granted by the Owner's Representative.
- B. The manufacturer's recommended methods of installation which, when recommended for approval by the Owner's Representative, shall become the basis for review and accepting or rejecting actual installation methods used on the work when not otherwise specified or detailed.

- C. Extreme care shall be exercised in excavating and working in the area due to existing utilities. Contractor shall be responsible for damages caused by his operations.
- D. Connections shall be made at approximately the locations shown on the drawings. Contractor shall be responsible for minor changes caused by actual site conditions.
- E. Landscape headers and mowing strips shall be in place before installation of sprinkler system.
- F. Specimen trees (24" box or larger) shall be installed prior to installation of irrigation equipment.
- G. Scaled dimensions are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions.
- H. Plan locations of heads driplines, valves, controller and pipe lines are diagrammatic and indicate the spacing and relative locations of all installations. All equipment shall be placed in planting areas unless directed otherwise.
- I. Dielectric bushings shall be used in any connections with piping of dissimilar metal materials.
- J. Point of connection shall be approximately as shown on drawings and approved by governing agency. Connect new underground piping and valves and provide all flanges, adapters or other necessary fittings for connection.
- K. Permission to shut off any existing in-use water line must be obtained 72 hours in advance, in writing from the Owner. The Contractor shall receive instructions from the Owner as to the exact length of time of each shut-off.
- L. Contractor shall acquaint themselves with all site conditions and proposed site conditions as indicated on the plans and specifications.
- M. Contractor is responsible for restoration, repair or replacement of existing or new work that is damaged due to their negligence.
- N. All existing areas disturbed or damaged by project construction shall be restored their original condition and / or complete working order.
- O. It is the responsibility of the Contractor to request inspection of work as noted in the observation schedule. Contractor shall refer to specifications and approved drawings for listing of observations and inspections.

PART 2 - PRODUCTS

2.00 MATERIALS

- A. Materials, equipment or suppliers shall be as shown on drawings or herein specified or approved equal in accordance with Section 01600.
- B. Piping: Pipe sizes shown are nominal inside diameter unless otherwise noted.

1. Polyvinyl Chloride Pipe :
 - a. Piping shall conform to the following:
 - 1) PVC Plastic Pressure Lines : For piping upstream of remote control valves and quick couplers. All one and one-half (1 1/2) inches and smaller shall be ASTM D-1784-1785 Type 1, Grade 1, PVC 1120, Schedule 40.
 - 2) Two (2) inch and larger shall be ASTM D-1784 Type 1, Grade 1, PVC 1120, Class 315 (SDR 13.5) ASTM D 2241, 2672 or 3139.
 - b. Plastic Non-Pressure Lines: For piping downstream of remote control valves, ASTM D-1784, Type 1, Grade 1 PVC 1120 Schedule 40, All lateral pipe end runs shall be 3/4" unless otherwise indicated.
 - c. Identification: Furnish plastic pipe continuously and permanently marked with following information: Manufacturer's name or trade mark, size, class and type of pipe, working pressure at 73.4oF, and National Sanitation Foundation (NSF) rating.
2. Brass Pipe : IPS Standard weight 125 pounds, 85% red brass.
3. Galvanized Pipe : ASTM A 53, standard weight.
4. Copper pipe shall be per governing codes.
5. Blank dripline irrigation tubing shall be made by the same manufacturer as the dripline tubing with inline emitters.

D. Fittings and Connections:

1. Fittings and couplings for plastic pipe shall be threaded or slip fitted tapered socket solvent weld type. Threaded female adapters shall be provided with socket pipe for threaded connections to threaded pipe Plastic pipe fitting and couplings shall be PVC Type 1 or PVC Tyoe 1 / 2 . Type and style of connection to match pipe and shall meet the requirements for service at an operating pressure of 150 pounds per square inch, unless otherwise specified.
2. All fittings on pressurized mainline shall be Schedule 80.
3. All threaded fittings shall be Schedule 80.
4. Slip fittings for non-pressure lateral lines shall be Schedule 40
5. Machine threaded fittings and plastic saddle and flange fittings are not acceptable. Furnish fittings permanently marked with following information: Nominal pipe size, type and schedule of material, and National Sanitation Foundation (NSF) seal of approval. PVC fitting shall conform to ASTM D2464 and D2466.
6. Swing joint assembly for large turf rotors shall be factory pre-assembled, with double O-rings and PVC Schedule 80 IPS pipe, Dura, Spears , Lasco or approved equal.
7. Polyvinly Chloride Schedule 80 Risers and Nipples: Type I, Grade I, Schedule 80, high impact molded, manufactured from virgin compounds specified, for

pipng and conforming to ASTM D-2464. Threaded ends shall be molded threads only. Machined threads are not acceptable. Spears Mfg. Co., Dura Plastic Products or equal.

8. Brass Pipe Fittings and Connections: ANSI B 43, IPS , Standard Weight 125 pound class, 85% red brass threaded fittings and connections.
9. Galvanized Iron Fittings and Connections: ANSI B 16.3, Class 150 zinc coated or ANSI 16.4, Class 125 zinc coated.
10. Copper fittings and connections: Per governing codes.
- 11.. Compression fittings, adapters and other special fittings for dripline line and polyethylene tubing shall be the same manufacturer as the dripper line/ tubing.
12. Thread lubricant shall be Teflon ribbon type , suitable for threaded installations as per manufacturer's recommendations.
13. Solvent cements and primers shall comply with ASTM D22564. Socket joints shall be made per recommended procedures for joining PVC plastic pipe and fittings with PVC solvent cement by the pipe and fitting manufacturer and procedures outlined in the Appendix of ASTM D2564. T Christy Enterprises, IPS Weld-On, or equal.

E. Automatic Controller Assembly and Equipment

1. Controller shall be furnished and installed complete with all electrical connections and ready for operation Controller Assembly "A" shall be as noted on the drawings.

F. Automatic Control Wire:

1. Electric wiring which runs from Controller to the automatic control valves shall be No. 14, solid, single conductor, copper wire, 1/16 in. insulation, 1/16 in. neoprene jacket, Style DB (Direct Burial) or equal.
2. Common wires shall be #12 size, white color. Control wires shall be #14 size for runs under 1500 feet and #12 size for runs greater than 1500 feet. Color code wires for valve stations shall be per City of Newport Beach standards.
3. All spare wires shall be #12 size, solid color red in color.
4. Wire splice connectors shall be waterproof 3M DBR-Y .
5. Specialized wire, communication cables, and connectors shall be as required by the controller assembly or component manufacturer specifications and shall be installed in conduit.

G. Flow Sensor /Flow Meter

1. As indicated on the drawings.

H ET/Rain Sensor

1. As indicated on the drawings.
- I. Remote Control Valves:
1. As indicated on the drawings.
- J. Drip Remote Control Valve Assembly:
1. As indicated on the drawings.
- K. Sprinkler Heads
1. Pop-up Spray Type: full or part circle pop-up spray type sprinkler body, stem, nozzle and screen constructed of heavy duty plastic. The sprinkler shall have a soft wiper seal for cleaning debris from pop-up stem as it retracts into case to prevent sprinkler from sticking up. The sprinkler shall have a matched precipitation rate nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall have a strong stainless steel retracting spring for pop down.
 2. Pop-up Rotary Type: Rotary sprinkler of the gear driven type, capable of covering area at pressure and maximum discharge indicated on the drawings.
 - a. The sprinkler shall be available in adjustable arc or in full or part circle configuration
 - b. The sprinkler shall have a 1/2" or 3/4" NPT inlet and shall be accessible by a threaded cap easy for service.
 - c. The nozzle shall be integrally molded multiple orifice type that can be changed with tools included. Radius shall be adjustable by a plastic, allen type diffuser pin. Nozzle turret shall be molded with a service indentation to accept a tool for raising nozzle piston for service.
 - d. The body of the sprinkler shall be constructed of non-corrosive heavy duty ABS. The sprinkler shall be equipped with a filter screen for debris stoppage.
- L. Subsurface Drip Irrigation:
1. Netafim, dripline, with pressure compensating emitters and check valves as indicated on the drawings.
 2. Dripline fittings and accessories shall be same manufacturer as dripline .
 3. Blank dripline shall be the same manufacturer as dripline with inline emitters
- M. Quick Coupler Assembly:
1. As indicated on the drawings.
- N. Check Valves:

1. 2 inch and smaller valves on non-pressure lines: MSS SP 80, Type 3, brass, bronze or plastic, 100 pound class, vertical spring loaded and swing check.
 2. 2-1/2 inch and larger valves on pressure lines: MSS SP 85, cast iron, 150 pound class, with no slam feature.
 3. Check valves for under sprinkler installation shall be as indicated on the drawings.
- O. Ball Valve /Gate Valve:
1. As indicated on the drawings..
- P. Anti-Drain Valves: Plastic construction with soft composition disc, stainless steel internal parts, and with spring tension adjustable from 4 psi to 15 psi.
- King Brothers Industries
Valcon ADS
- Q. Backflow Preventer and Enclosure:
1. As indicated on the drawings.
- R. Valve Boxes: Valve boxes shall be plastic valve boxes, with lockable covers with stainless steel bolts. The boxes/lids shall be green color. . Minimum sizes of valve boxes shall be as follows:
1. Remote Control Valves (RCV and Master Valve): 14" x 19"
 2. Globe and Ball Valves: 9 inch diameter or 14"x 19"
 3. Flow Sensor: 14 inch by 19 inch
 4. Valve boxes shall be NDS Pro Series Plus, Rainbird VB Specification series or equal
- S. Tracer Wire: AWG #. 10, Type TW plastic coated solid copper wires.
- U. Concrete thrust blocks and footings shall conform to compressive strength of 2,000 p.s.i. concrete at 28 days.
- V. Sand bed and backfill shall be Class A clean fill sand or approved equal.

PART 3 - EXECUTION

3.00 INSPECTION:

- A. Inspect site and check all grades.
- B. Carefully verify all dimensions at site and existing conditions prior to demolition and compare with proposed work.

1. Repair, replace and restore all irrigation in areas within and adjacent to the general limit of work as impacted by project construction and indicated on the plans
- C. Report in writing all discrepancies or errors between Drawings and existing conditions to Owner's Representative and resolve them before proceeding with the work in this section.
- D. Locations on Drawings are diagrammatic and approximate only, and shall be changed and adjusted as necessary and as directed to meet existing conditions and obtain complete water coverage. Locate and stake all work and obtain approval of the Engineer before any installation.
- E. Install and extend system as shown on the Drawings, and as necessary to carry out the intent of the Drawings and Specifications.
- F. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, Contractor shall make all necessary adjustments prior to proceeding with planting.
- G. Locate lines, valves, and other existing underground utilities prior to starting work and shall protect all existing utilities from damage during the course of construction. Obtain approval of the Engineer before digging trenches or interrupting utility service.
- H. The Contractor shall obtain permits and call for inspections required by local codes and regulations.
- I. Contractor is responsible for the coordination and installation of all sleeves required for the proper installation of the irrigation.

3.01 PREPARATION:

A. Field Measurements:

1. Layout and staking: Prior to installation, stake sprinkler head locations in accordance with the Drawings.
2. Piping layout: Make any adjustments to avoid damage to existing improvements, provide for future installation of specimen plant material, and conform to actual field conditions. Install sleeving and conduit as necessary.

- B. Protection: Protect existing and new improvements and systems installed prior to irrigation installation, maintain in place until completion of work.

3.02 INSTALLATION OF IRRIGATION SYSTEM:

A. General:

1. All irrigation system work including hydrostatic testing, coverage trenches, and other excavation shall take place after finish grading and before soil tests, and densification of planting.
2. The Contractor shall be responsible for furnishing the labor and materials to connect to the service connections for water and electrical.

3. All irrigation piping and control wires under paving through walls and footings shall be placed in sleeves.

B. Excavation and Backfilling of Trenches:

1. Excavate trenches, prepare subgrade, and backfill to line and grade with sufficient room for pipe fittings, testing and observation operations. Do not backfill until the pipe system has been subjected to a hydrostatic test as specified.
2. Depth of trench for piping in planting areas and for sleeving in non-paved areas:

Polyvinyl Chloride Pressure Line :

4" diameter or greater	36" cover
3 " diameter pipe	24" cover
2 1/2" diameter and smaller	18" cover

Polyvinyl Chloride Non-Pressure Line: 12" cover

Control Wiring 18" cover

Polyethylene tubing (where indicated to be buried) 4" uniform depth or as indicated on the drawings

Schedule 40 PVC sleeves under paving:

4" diameter or greater	36" cover
3" diameter	30" cover
2 1/2" diameter and smaller	24" cover

3. Trenching through areas where topsoil has been spread: Deposit topsoil on one side of trench and sub-soil on opposite side.
4. In landscape areas provide sand bedding a minimum of 2" under and 4" above top of PVC plastic pipe and brass pipe installed prior to the placement of backfill material.
5. Pipes shall be encased in sand on all four sides prior to placement of backfill.
6. Repair any leaks and replace all defective pipe or fittings until lines meet test requirements. Do not cover any lines until they have been inspected and approved for tightness, quality of workmanship and materials.
7. Backfill trenches, after approval of piping, with suitable and approved material, tamping soil around pipe and thoroughly compacting all trench fills until 90% compaction has been achieved.
8. Backfill material shall be as indicated on drawings or an approved soil, free from rocks and clods.
9. Trenches located under areas where paving, asphaltic concrete or concrete, will be installed shall be backfilled with sand (a layer six (6) inches below the pipe and six (6) inches above the pipe) and compacted in layers to 90% compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a

firm unyielding condition. All trenches shall be left flush with the adjoining grade. The sprinkler irrigation Contractor shall set in place, cap and pressure test all piping under paving prior to the paving work.

10. Generally, piping under existing walks may be accomplished by jacking or boring, but where any cutting or breaking of sidewalk and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Owner.

C. Installation of Polyvinyl Chloride Pipe:

1. Because of the nature of plastic pipe and fittings, exercise caution in handling, loading and storing, to avoid damage.
2. The pipe and fittings shall be stored under cover until using, and shall be transported in a vehicle with a bed long enough to allow the length of pipe to lay flat so as not to be subjected to undue bending or concentrated external load at any point.
3. Any pipe that has been dented or damaged shall be discarded until such dent or damaged section is cut and rejoined with a coupling.
4. Trench depth shall be as specified above from the finish grade to the top of the pipe. The bottom of the trench shall be free of rocks, clods, and other sharp-edged objects.
5. Pipe ends and fittings shall be wiped with MEK, or equal, before welding solvent is applied. Welded joints shall be given a minimum of 15 minutes to set before moving or handling. All field cuts shall be bevelled to remove burrs and excess before fitting and gluing together.
6. Pipe shall be snaked from side-to-side of trench bottom to allow for expansion and contraction.
7. Center load pipe with small amount of backfill to prevent arching and slipping under pressure. Leave joints exposed for observation(s) during testing.
8. No water shall be permitted in the pipe until observations have been completed and a period of at least 24 hours has elapsed for solvent weld setting and curing.
9. Plastic to metal joints shall be made with plastic male adapters, metal nipple hand tightened, plus one turn with a strap wrench.
10. Plastic to Plastic Joints: Solvent-weld, using solvent recommended by pipe manufacturer only.
11. Solvent-Weld Joints: Assemble per manufacturer's recommendations.
12. Thrust blocks for all specified piping shall be of size and type required by the manufacturer's installation guide.

D. Installation of Brass Pipe and Galvanized Iron Pipe.

1. Cut piping by power jacksaw, circular cutting machine using an abrasive wheel, or hand hacksaw. Cut no piping with metallic wheel cutter of any description. Ream and remove rough edges of burrs so smooth and unobstructed flow is obtained.
 2. Carefully and smoothly place Teflon tape on male thread only. Tighten screwed joints with tongs or wrenches. Caulking is not permitted.
- E. Dielectric bushings shall be used for connections of piping of dissimilar metal materials.
- F. Tracer Wires:
1. Tracer wire shall be installed with plastic irrigation main lines.
 2. The tracer wire shall be placed on the bottom of the trench under the vertical projection of the pipe with spliced joints soldered and covered with insulation type tape.
 3. Tracer wire shall follow the main line pipe and/or branch lines and terminate in the yard box with the control valves. Provide enough length of wire or tape to make a loop and attach a "Dymo-Tape" type plastic label with the designation "Tracer Wire."
- G. Automatic Sprinkler Controller Assembly: Shall be as indicated on the drawings..
1. Connections to control wiring shall be made within the Controller cabinet.
 2. Electrical wiring shall be in a rigid PVC plastic conduit from controller to electrical outlet. The Electrical Contractor shall be responsible for installing all wiring to the sub-panels, clocks, or elsewhere as required, in order to complete this installation. A disconnect switch shall be included.
 3. Contractor shall contact controller representative for field assistance with controller assembly and connections to peripheral component installation.
 4. Contractor shall provide written confirmation from controller representative that assembly and peripheral components are functioning properly and the system has been installed properly.
- H. Flow Sensor
1. Install flow sensor in location and per details indicated on the drawings.
 2. Flow sensor cable shall be installed in a conduit between sensor and controller.
 3. Set sensor as required by the Controller manufacturer.
- I. ET/Rain Sensor
1. Install on building eave at general location shown on site and per manufacturer recommendations.
- J. Remote Control Wiring:
1. Direct Burial Control Wire Sizes: As specified.

2. Provide one control wire and one common ground wire to service each valve in system. Provide 24" minimum expansion loop at each valve to permit removal and maintenance of valves.
 3. Control wire shall be located in mainline trenches where possible and bundled and taped to the pipe per applicable sections of "Greenbook" Section 801-5.6.
 4. Control Wire Splices: Allow only on runs of more than 300-feet and shall be made only in valve or pull boxes only. All wires in pull boxes shall be loose and shall not come within three (3") from lid. Each wire splice shall be encased in the waterproof epoxy of waterproof connectors.
 5. Testing: All wiring shall be tested for continuity, open circuits and unintentional grounds prior to connecting to equipment. The minimum insulation resistance to ground shall be 50 megaohms. Any wiring not meeting this requirement shall be replaced, at the Contractor's expense. The responsibility and cost of testing lies with the contractor to ensure that it is completed under the observation of the Owner's Representative.
 6. Numbering and Tagging: Identify direct burial control wires from automatic valves to terminal strips or controller at terminal strip by color coding and tagging wire with number of connected valve.
 7. Include two (2) red (#14 AWG) spare wires from furthest valve or manifold on each end run to each controller and any additional spare wires as noted on Drawings.
- L. Remote Control Valves and Drip Control Valve Assemblies: Install valves and assemblies in locations as shown on the drawings, with a cover of 4 1/2 inches minimum over top of flow control stem. Install a union type connection. Fit with valve box and locking cover with stainless steel bolt.
- M. Valve Box: Install valve boxes as shown on detail. Install no more than one valve per box. Valve boxes shall be branded with the Station number and controller. All other valves shall be identified by function. Letter size shall be 3" minimum.
1. Pull Boxes shall be labeled "PB" in like manners described for remote control valves: gate valve shall be labelled "GV"; ball valve shall be labelled "BV"
- N. Drip Irrigation:
1. Contractor shall install a complete and functional system including valves, pressure regulators, filters, ball valves, PVC and/or polyethylene piping, dripline, air relief valves, flush valves and access sleeves.
 2. Contractor shall test the system to determine that the rate of application of the system matches the rating of the emitters.
 3. All drip irrigation equipment shall be installed as directed by manufacturer and as indicated on the Drawings.
 1. Contractor shall be familiar with procedures for handling dripline tubing.
 5. Do not bend dripline tubing beyond the radius specified by the manufacturer. Use elbows and fittings whenever required to make a tight turning radius.

6. Cover ends to avoid getting debris into the lines.
7. Install dripline drip tubing in appropriate weather conditions.
8. System shall run prior to covering with soil backfill to test for leaks and coverage.
9. Verify on site that manual flush valve is at lowest point of each valve zone.
10. Install air relief valve in a header or blank line that runs perpendicular to the lateral rows to ensure all rows of the dripline take advantage of the air/vacuum relief.
11. Plans are diagrammatic and approximate. Precise location of drip tubing shall be adjusted to meet minor variations of field/site conditions. Contactor shall review planting layout and mark location of all plants prior to installing dripline or install plants, if required, prior to installing the dripline tubing.
12. Dripline tubing shall be installed below grade. Staples shall be used at a minimum of four (4) feet on center, at turns and as specified by manufacturer.
13. Review/coordinate on site the location of drip remote control valves and location of vertical supply laterals with Engineer prior to beginning installation work to ensure evenly balanced systems.

O. Flushing of System:

1. After all new sprinkler pipe lines and risers are in place and connected, all necessary work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.
2. Sprinkler heads/ emitters shall be installed only after flushing of the system has been accomplished.
3. Sprinklers heads shall be adjusted upon installation to prevent overspray onto non-irrigated areas prior to the performance of the coverage test.

Q. Sprinkler Heads:

1. All sprinkler heads shall be installed as indicated on drawings.
2. Nozzle size of all heads shall be adjusted to suit particular conditions of the area. This shall be done after the system has been thoroughly tested.

R. Quick Coupler Assembly:

1. Install all quick couplers as indicated on drawings and as directed by the Engineer. Set all valves plumb and true to finish grade at a maximum of 12 inches from paving, walks, headers or curbs, and as shown on plans and as directed.

S. Manual Control Valves: Install control valves in locations as shown on the drawings, with a cover of 4 1/2 inches minimum over top of flow control stem. Install per details indicated.

T. Concrete Footing: Footings shall be placed on 90% minimum compacted or undisturbed subgrade. Construct to shapes specified and parallel to adjacent paved areas. Broom finish exposed surfaces

3.01 CLEAN-UP

- A. As project progresses, Contractor shall maintain all areas in a neat manner and remove unsightly debris as necessary. After completion of project, Contractor shall remove all debris and containers used in accomplishing work. Sweep and clean all sidewalks, asphalt, and concrete areas adjacent to plantings. Contractor shall clean all vertical surfaces adjacent to planting areas that may have been affected by his work

END OF SECTION

SECTION 32 90 00

LANDSCAPING

PART 1 – GENERAL

1.00 SUMMARY:

- A. Section Includes: Planting of trees, shrubs and maintenance of such planting.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.01 DEFINITIONS:

- A. The term "Planting Area" shall mean all areas to be planted with trees and shrubs.

1.02 SUBMITTALS:

- A. Submit the following for tree, shrub and plant samples: Provide one PDF file illustrating one typical photo labeled with scientific name, cultivar, and size of each plant species and every species listed as 'specimen' in the Plant Schedule on the plans. Digital photos will be used as base line standard for plant size, fullness, and condition and will be used to compare the remainder of the plant materials for the project at the project site during installation. At the contractor's option and expense, he may retain the services of the Landscape architect to review trees tagged at the nursery or at place of growth.
- B. Submit certificate of compliance / manufacturer cut sheet in one PDF file of:
 - 1. Soil amendments
 - 2. Fertilizers
 - 3. Root barrier
 - 4. Tree stakes
 - 5. Tree ties
 - 6. Compost materials
 - 7. Wood mulch
 - 8. Root Control Fabric
 - 9. Gravel free french drain system
- C. Agronomic Soils Testing:
 - 1. Furnish two (2) sets of soils analysis of existing on-site soil.
 - 2. There shall be two (2) sampling areas located throughout the site as selected by the landscape architect.

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3. Take the first core samples of site soil at a depth of 6 to 12 inches at each location, within proposed planting areas, after completion of final grading and prior to weed control and soil preparation.
4. Testing laboratory shall be Waypoint Analytical (714) 282-8777 or approved equal. Costs of tests shall be included in Contractor's Contract Sum.
5. Request testing for fertility and suitability analysis with written recommendations for soil amendment, fertilizer and chemical conditioners, application rates for soil preparation, planting backfill mix, and post-maintenance fertilization programs. Include plant material list with soil samples to lab. Lab to comment on plant material suitability. Testing to include AO5-2/WELO analysis and recommendations.
6. Planting requirements and soil amendment specifications are based on similar site conditions and may need to be revised based on the findings of the soils analysis tests. Soils analysis recommendations shall take precedence over the amendment and fertilizer application rates specified in this Section.
7. Submit testing laboratory's interpretation, recommendations, and comments to Owner's Representative within 14 days after the completion of rough grading.
8. Second core sample soil testing shall be conducted for organic suitability after completion of planting in the soil preparation and backfill mix areas. Submit to the testing laboratory the original amendment specification with previously issued recommendations for soil amendments and installation procedures. Provide two (2) random samples of planting soil for analysis. Locations selected by the Owner's Representative. A05-2 interpretations shall be furnished by the testing laboratory to ensure all specified amendments made have been provided.

1.03 QUALITY ASSURANCE:

- A. After installation of plant materials but before the pre-maintenance inspection, the Owner's Representative, using the specified copies of the certificates, trip slips, and invoices for the plant materials and related items, will check such material, comparing the total quantities of each material furnished against the total area and the quantities specified. If the minimum amounts have not been furnished, the Owner's Representative will require the installation of additional materials to fulfill the minimum requirements specified.
- B. Upon delivery of materials and completion of soil conditioning and grading but before initiating planting operations, the Owner's Representative using the specified copies of certificates, trip slips, and invoices for soil preparation materials, will check such material comparing the total quantities of each material furnished against the total area of each operation. If the minimum rates of application have not been met, the Owner's Representative will require the distribution of additional quantities of these materials to fulfill the minimum application requirements specified.
- C. Deliver a sample of the soil amendments to the Owner's Representative within 35 days after "Notice to Proceed" for submittal to a testing laboratory. After soil amendments have been thoroughly mixed into the site, take random samples of the mixed soil and deliver them to the testing laboratory for comparison to a control mix. Responsibility for payment for testing by the contractor.

1.04 SITE CONDITIONS

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A. Environmental Requirements:

1. Perform actual planting during those periods when weather and soil conditions are suitable in accordance with locally accepted horticultural practice.
2. Perform grading and soil preparation only during the period when beneficial and optimum results may be obtained. If the moisture content of the soil should reach such a level that working it would destroy soil structure, suspend spreading and grading operations until the moisture content is increased or reduced to acceptable levels and the desired results are likely to be obtained.

B. Existing Conditions:

1. Before excavation for planting or placing of plant materials, locate underground utility lines and take proper precautions to avoid damage to such improvements. In the event of a conflict between such lines and plant locations, notify the Owner's Representative who will arrange for the relocation of one or the other. Assume responsibility for making repairs to damage to existing facilities resulting from landscaping activities.
2. Utilities (water and electricity) used during the installation of the landscaping and irrigation systems shall be paid for as specified in Section 01700. During the one (1) year maintenance period the Owner will be responsible for the payment of the utilities.

C. Field Measurements:

1. Scaled dimensions are approximate. Before proceeding with landscaping, carefully check and verify dimensions and immediately inform the Owner's Representative of discrepancies between the drawings and specifications and actual conditions.

D. Plant Quantities:

1. Quantities of plant materials are shown for convenience only and are not guaranteed. Contractor shall check and verify count and supply the sufficient number to fulfill the intent of the drawings.

1.05 GUARANTEES AND REPLACEMENTS:

- A. Guarantee shrubs, vines and ground covers to remain healthy and vigorously growing condition for a period of ninety (90) days from date of written approval to begin the maintenance period.
- B. Guarantee trees to live in a healthy and vigorously growing condition for a period of one (1) year from date of written approval to begin the maintenance period.
- C. Replace within 14 days, plants found to be dead and plants not in a vigorous condition noted within the guarantee period.
- D. Use plants for replacement of the same kind and size as specified in the plant list. Furnish plant and fertilize as originally specified.

1.06 MAINTENANCE:

- A. The maintenance period begins on the first day after all landscape work on this project is complete, checked, accepted, and written approval from the Owner's Representative is given

to begin the contract maintenance period, and shall continue thereafter for no less than ninety (90) continuous calendar days.

- B. Continuously maintain all involved areas during the progress of the landscaping operations and during the maintenance period until the final acceptance of the work.
- C. Regular planting maintenance operations shall begin immediately after each plant is planted. Plants shall be kept in a healthy, growing condition and in a visually pleasing appearance by watering, pruning, trimming, edging, fertilizing, restaking, pest and disease controlling, spraying, weeding, cleaning-up, trash removal and other necessary operation of maintenance. Landscape areas shall be kept free of weeds, noxious grass, and other undesired vegetative growth and debris. Plants found to be dead or in an impaired condition shall be replaced immediately.
- D. The completion date of the contract maintenance period will be extended, when in the opinion of the Owner's Representative, improper maintenance or possible poor or unhealthy condition of planted material are evident at the termination of the scheduled maintenance period. Assume responsibility for additional maintenance of the landscaping until landscaping is completed and acceptable.
- E. Assume responsibility for maintaining adequate protection of the areas. Repair damaged areas immediately.
- F. Provide a written memorandum prior to beginning the 90 day contract maintenance period site, plant material and irrigation maintenance duties that will be performed on a weekly basis. Subsequent to the completion of the contract maintenance period prepare a second memorandum outlining on a monthly basis site, plant material and irrigation maintenance required for maintaining a visually appealing site appearance.

PART 2 - PRODUCTS

2.00 SOIL AMENDMENT AND FERTILIZER:

- A. Organic Soil Amendment (composted): Type 1 organic soil amendment. Contain a special blend of organic fractions to supply several degrees of breakdown rate, a portion of inorganic amendment that resists further breakdown, a long-lasting form of iron, pH of 5.5 to 7.0, EC of less than 3 dS/m, organic matter (dry weight basis) more than 90 percent, non-ionic wetting agent and total nitrogen content of 0.5 percent. Acceptable products or equal:

Organo-Grow, MB Organics
- B. Gypsum: Commercially processed and packaged gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) with minimum 80 percent grade containing 14 percent minimum combined sulfur.
- C. Iron Sulphate: Ferric or ferrous sulphate in pelleted or granular form containing not less than 18 percent metallic iron. Material shall conform to the Agricultural Code of the State of California.
- D. Soil Sulfur: Elemental sulfur (99.5 percent) minimum.
- E. Fertilizer:

1. Preplanting Fertilizer: Long-lasting, controlled release, uniform in composition, free-flowing, suitable for application with approved equipment, and shall contain the following minimum available percentages by weight of plant food:

Nitrogen	6 percent minimum
Phosphoric Acid	20 percent minimum
Potash	20 percent minimum

2. Post-planting Fertilizer: Organic base, long lasting, non-burning, slow release, free flowing, uniform in composition, suitable for application with approved equipment, and shall contain the following minimum available percentages of weight of plant food with trace minerals of 3 percent iron (expressed metallic) and 5 percent sulfur (elemental).

Nitrogen	16 percent minimum
Phosphoric Acid	6 percent minimum
Potash	8 percent minimum

3. Planting Tablets: Tightly compressed chip type commercial grade planting tablets, of varying sizes with the following available percentages by weight of plant food:

	<u>21 gram tablet</u>	<u>5-7 gram tablet</u>
Nitrogen	20% minimum	12% minimum
Phosphoric Acid	10% minimum	8% minimum
Potash	5% minimum	8% minimum

2.01 SOIL AMENDING, FERTILIZING AND ROTOTILLING::

- A. Planting backfill for specimen trees and 15-gallon container plants shall be a thoroughly blended mixture of amendments, fertilizer and native backfill soil. The following materials and quantities are to be used as a basis for bidding and shall be modified on soil analysis results.

Soil Amendment	25% (top 12" for trees / top 6" for 15-gal. plants)
Stockpiled on-site soil	75%
Iron Sulphate	2 pounds per cubic yard of mix
Gypsum	10 pounds per cubic yard of mix
Pre-Plant Fertilizer	4 pounds per cubic yard of mix
Soil Sulfur	1 pounds per cubic yard of mix

- B. After shrub and groundcover areas have been graded, soil conditioning and amendment materials shall be evenly spread and thoroughly scarified to an average depth of six (6) inches by rototilling a minimum of two (2) alternating passes:
The following materials and quantities are to be used as a basis for bidding, and shall be modified based on soil analysis results:

1. Soil conditioner: 6 cu. yd. per 1,000 sq. ft.
2. Soil sulphur: 20 lbs/per 1,000 sq. ft.
3. Iron sulphate: 20 lbs/per 1,000 sq. ft.
4. Gypsum: 100 lbs/per 1,000 sq. ft.
5. Pre-plant fertilizer: 20 lbs/per 1,000 sq. ft.
 - (a) Fertilizer shall be incorporated into the top six (6) inches of finish grade. Fertilizer shall be applied after leaching operation (if leaching is required).
 - (b) The thoroughness and completeness of the rototilling and incorporation of the soil conditioners/amendments shall be accepted by the landscape

architect in writing, prior to digging planting pits. For slopes 2:1 and steeper, or as per the drawings, omit soil conditioner application and rototilling.

2.02 PLANT MATERIALS:

- A. Nomenclature: The scientific and common names of plants herein specified conform with the approved names given in "Sunset Western Garden Book", published by Lane Publishing Company, Menlo Park, California, latest edition. Refer to list of plant material on drawings.
- B. Quality and size of plants shall be No. 1, of Pinto Tag stock. They shall be vigorous, of normal growth, free from disease, insects, insect eggs, and exceed the measurements specified. Pinto Tags shall be submitted to the Owner's Representative.
- C. Container stock (1 gallon, 5 gallon, 15 gallon and boxes) shall have been grown in containers for at least 6 months, but not over 2 years. No container plants that have cracked or broken balls of earth, when taken from the container, shall be planted, except upon special approval. No trees with damaged roots or broken balls shall be planted.
- D. Pruning shall not be done, before delivery, except by written approval of the Owner's Representative.
- E. Root pruning of existing trees shall be done under the supervision of a certified arborist approved by the Owner's Representative.
- F. Inspection of plant materials, required by County or State authorities, shall be the responsibility of the Contractor, and where necessary he shall secure permits or certificates before delivery of plants to site.
- G. Plants shall be subject to inspection and approval or rejection, at the site at any time before or during progress of landscaping, for size, variety, condition, latent defects and injuries. Immediately remove rejected plants from the site.
- H. Substitutions will not be permitted except that if proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety and cost. All substitutions are subject to Owner's Representatives approval in accordance with the General Conditions.
- I. Quantities shall be furnished as needed to complete landscaping indicated.
- J. The Owner's Representative reserves the right to inspect root condition of any species, particularly those grown from seed, and if found defective, to reject the plants represented by the defective sample.
- K. Identify plant species or varieties correctly on legible, weatherproof labels attached securely to plant. There shall be a minimum of one labeled plant for each 5 plants in a b
- L. Weed Contact Spray: Post emergent, systemic product with no soil residual activity formulated as a water soluble liquid containing 50% glyphosate and 14.5% surfactant with surflan additive. Use only on noxious weeds that cannot be successfully eradicated with hand weeding.

2.03 ROOT CONTROL FABRIC:

- A. Root control fabric shall be a multi-year root control system consisting of herbicidal time released nodules permanently attached to a permeable fabric. Root control barrier system shall be by Biobarrier or an approved equal.
- 2.04 ROOT BARRIER:
- A. Root control barrier shall be made of a rib system, polypropylene material with a minimum thickness of 0.08 inches. The height of the root barrier shall be a minimum ~~24~~ **18** inches high. Root control barrier system shall be by Deeptree or an approved equal.
- 2.05 TREE STAKING:
- A. Double staking: Lodge pole pine stakes, stakes shall be 2" outside diameter, min. ~~8'~~ **10'** long, ~~10' for 24" box trees, 12' for 36" box trees.~~ **and minimum 12' long for 24" and 36" box tree sizes.**
 - B. Tree ties shall be "Cinch" ties commercially manufactured by VIT of Equal.
- 2.06 WOOD MULCH:
- A. Landscaped or bare soil areas (with the exception of areas shown on the plans with decomposed granite, crushed rock, hydroseed) shall be covered with wood mulch, dark brown in color, 2" minus size. Foreign materials such as plywood or particle board incorporated within the mulch blend will not be accepted. Wood mulch shall be weed free. Wood mulch shall be well seasoned. Fresh wood chips are not acceptable. Install minimum 3 inch depth of mulch. Acceptable product or equal:

Premium Landscape Mulch, MB Organics & Organic Solutions.
- 2.07 GRAVEL FREE FRENCH DRAIN SYSTEM:
- A. Engineered, gravel free french drain system that includes a 10-inch diameter polystyrene aggregate bundle encased in 30-sieve geotextile mesh. A 4-inch diameter slotted corrugated pipe is centered within the bundle. NDS EZ-1001F French Drain or approved equal.
 - B. Flow Capacity: 170.3 gpm at a 1% slope.
 - C. Storage Volume: 36.5 gallons per 10 foot bundle.

PART 3 - EXECUTION

- 3.00 FINISH GRADING:
- A. Finish grades shall be as indicated on the Grading Plans.
 - B. Finish grades shall be measured as the final water compacted and settled surface grades and shall be within + 0.1 foot of the spot elevations and grade lines indicated on grading plans.
 - C. Finish grades shall be measured at the top surface of surface materials.

- D. Molding and rounding of the grades shall be provided at all changes in slope.
- E. Undulations and irregularities in the planting surfaces resulting from tillage, rototilling and other operations shall be leveled and floated out before planting operations are initiated.
- F. Take precautions to protect and avoid damage to sprinkler heads, irrigation lines, and other underground utilities during grading and conditioning operations.
- G. Final finish grades shall insure positive drainage of the site with surface drainage away from buildings, walls, and toward roadways, drains and catch basins.
- H. Final grades shall be acceptable to the Inspector before planting operations will be allowed to begin.
- I. Planting surfaces shall be graded with no less than 2 percent surface slope for positive drainage.

3.01 PLANTING:

- A. The layout of locations for plants and outlines of groundcover to be planted shall be approved on the site by the Owner's Representative, before their planting. All such locations shall be checked for possible interference with existing underground piping, before excavation of holes. If underground construction or utility lines are encountered in the excavation of planting areas, other locations for the planting may be selected by the Owner's Representative. Damage to existing utilities shall be the responsibility of the Contractor.
- B. Planting Shrubs and Vines:
 - 1. Excavated holes shall have vertical sides with roughened surfaces and shall be of minimum sizes indicated. Holes shall be, in all cases, large enough to permit handling and planting without injury or breakage of root balls or roots.
 - 2. Excavation shall include the stripping and stacking of all acceptable soil encountered within the areas to be excavated for plant pits and planting beds. Protect areas that are to be trucked over and upon which soil is to be temporarily stacked pending its re-use for the fillings of holes, pits and beds.
 - 3. Excess soil generated from the planting holes shall be spread on the site as directed or removed from the site at the contractor's expense.
 - 4. Plants in can containers shall have the cans opened by cutting vertically on opposite sides of each can with nursery can openers, tin snips or other approved instruments for this purpose. All used cans shall be removed to the storage area or from the site daily.
 - 5. The plants shall be planted at approved locations with the specified conditioner and soil planting backfill.
 - 6. The plants shall be placed in the planting pits on the backfill material which has been hand-tamped and water settled to the rootball base levels before the placement of the plants. After setting the plants, the remaining backfill material shall be carefully tamped and settled around each rootball to fill all voids.

7. Each shrub shall be placed in the center of the hole and shall be set plumb and held rigidly in position until the planting backfill has been tamped from around each root ball.
8. All plants shall be set at such a level that after settling they bear the same relationship to the surrounding finish grade as they bore to the soil line grade in the container, unless otherwise indicated.
9. Planting tablets shall be placed in each planting hole at the following rates:
 - 1-5 gram tablet per liner and flat size plant.
 - 1-21 gram tablet per 1 gallon container.
 - 3-21 gram tablets per 5 gallon container.
 - 4-21 gram tablets per 15 gallon container.
 - 1-21 gram tablet per each 4 inch of box size.
10. No plant will be accepted if the rootball is broken or cracked, either before, during, or after the process of installation.
11. All plants shall be thoroughly watered in to the full depth of each planting hole immediately after planting.
12. The staking shall be accomplished in such a manner as to ensure the proper and healthy growth and the safety of the plants, property, and the public.
13. The Contractor shall be responsible for all surface and subsurface drainage required which may affect his guarantee of the trees, shrubs, and vines.
14. Pruning after planting shall be required on all shrubs, and vines when necessary to provide the specified or approved standard shapes, form and sizes characteristic to each plant. Pruning may include thinning, topping, and cutting and shall be under the direction of the Owner's Representative. Cuts over 3/4 inch in diameter shall be painted with an approved tree sealant.

3.02 HERBICIDE APPLICATION / WEED ERADICATION:

- A. Herbicide or pesticide application shall be performed only when necessary for noxious weed eradication only after all hand weeding operations have failed and only by personnel licensed for such work by the State of California.

3.03 FIELD QUALITY CONTROL:

- A. Inspection: Inspections herein specified shall be made by the Owner's Representative. The Contractor shall request inspection 48 hours in advance of on site visit.
- B. Inspection will be required for the following parts of the landscaping:
 1. Pre-job conference.
 2. Trenching (irrigation & utilities).
 3. Pressure test main line.
 4. Irrigation coverage.
 5. Tree / shrub placement and planting.

ISSUED FOR CONSTRUCTION

Newport Beach Fire Station No. 1 and Library
Newport Beach, California

02/05/26
Landscaping
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8. Start of maintenance period.
9. Periodic 30-day Inspection.
10. Final Inspection.

3.04 CLEAN UP:

- A. As landscaping progresses, maintain all areas in a neat manner and remove unsightly debris as necessary. After completion, remove debris and containers used in accomplishing landscaping. Sweep and clean all sidewalks, asphalt, and concrete areas adjacent to plantings.

3.05 SITE OBSERVATION & WALK-THROUGHS FOR SUBSTANTIAL COMPLETION:

- A. General Observation: The Landscape architect will visit the construction site at interim times during the construction process to access construction progress. The Landscape architect will prepare a site report after each visit noting progress of installation, verbal communication with the contractor and identifying any field adjustments necessary that require modifications to the designed landscape. A copy of this site report will be delivered to both the owner and the contractor. The contractor is responsible to immediately address each item on the site report before proceeding with further construction.
- B. Walk through for Substantial Completion (Punch List #1):
 1. Before requesting a walk through for substantial completion the following requirements must be entirely satisfied:
 - (a) The entire planting area is completely installed, and when letters of acceptance as described above have been obtained from the Landscape architect and/or owner's representative. If the contractor failed to notify the Landscape architect for any of the above items as listed above than the contractor assumes full responsibility for any design modifications directed by the Landscape architect during the walk through for substantial completion any of these issues at no additional cost to the owner.
 - (b) All invoices, pinto tags and receipts have been delivered.
 2. Once the above requirements have been met a walk-through for substantial completion may be requested. The following procedures will be used during the walk through:
 - (a) A visual walk through of the entire site will take place consisting of an examination of planting areas as compared to the drawings, and installation procedures as shown on the details and specifications. A punch list will be established for deficiencies in the construction and workmanship of the landscaped area as compared to the construction drawings, details, and specifications.
 3. Once the Walk Through for Substantial Completion has been completed the Landscape architect will provide a copy of all punch list items to the owner for review and distribution to the contractor. It is the contractor's responsibility to repair, replace, and adjust all items on the punch prior to requesting a final walk through.
- C. Final Walk Through:

1. Before commencement of a final walk through is requested, each item on the walk through for substantial completion (punch list #1) must be thoroughly satisfied, addressed, and resolved by the contractor.
2. Once the above requirement has been met a final walk-through may be requested.

END OF SECTION

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SECTION 331116

WATER UTILITY DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. On-site domestic and fire water main distribution system consisting of piping, valves, on-site fire hydrants and related other equipment.
- B. Testing and certification.

1.2 REFERENCES

- A. City of Newport Beach Standards and Specifications.
- B. N.F.P.A. Standard 24, "Private Fire Service Mains", latest published edition, as adopted by serving jurisdictional authority.
- C. Serving jurisdictional authority Fire Department fire prevention regulations, including local Fire Department Standard Specifications for materials and installation of the Work pertaining to fire protection systems.
- D. State Water Resources Control Board's Division of Drinking Water, "California Regulations Related to Drinking Water" (CCR, Title 22), latest published edition.
- E. Applicable portions of California Plumbing Code for materials and installation of the Work of this Section.
- F. Standard Specifications for Public Works Construction (SSPWC) ("Green Book") 2015 Edition, with amendments as adopted by serving jurisdictional authority.

1.3 QUALITY ASSURANCE

- A. Contractor Qualifications
 - 1. Installing Contractor shall have Class A - General Engineering or Class C-16 Fire Protection Contractor license.
 - 2. Installing Company: Company specializing in installation of water line systems, with minimum 5 years documented experience in installation of projects of similar scale and scope.
 - 3. Installing Foreman: Individual specializing in installation of water line systems, with minimum 5 years documented experience in installation of projects of similar scale and scope.
 - 4. Use only staff who are completely familiar with the manufacturers' recommended methods of installation as well as the requirements of this work.

B. Listing Requirements

1. Provide UL listed and FM approved valve assemblies.

1.4 SUBMITTALS

- A. Submit Submittals in accordance with the provisions of Section 013000.
- B. Materials List: Provide complete list of all proposed materials and accessories, including product data on performance criteria.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site under provisions of the General Conditions.
- B. Store and protect products under provisions of the General Conditions.

1.6 PUBLIC AGENCY STANDARDS

- A. Perform all work and related structures and devices indicated, in accordance with the Regional Standards Drawings as indicated on the plans and these specifications and the Standard Specifications for Public Works Construction (SSPWC) "Green Book", 2016 Edition and the latest California Plumbing Code.
- B. Provide water main separation per "Guidance Memo No. 2003-02: Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines" by the State of California Department of Health Services dated October 16, 2003, and subsequent updates.

1.7 WARRANTY

- A. Warranty
 1. In addition to the guarantees required in the General Conditions, provide, in Architect approved form, the Owner with a guarantee against the following specific defects or failures for a period of two years after Notice of Substantial Completion:
 - a. Pavement or landscaping area subsidence, settling, transfer cracking or other surface defects due to improper trench backfilling.
 - b. Water leakage in any form.
 - c. Paint coating failure of above grade components.
 - d. Landscape planting material death.
 2. Should defects or failures occur or develop during this period due to defective materials or faulty workmanship, furnish all labor and materials necessary to replace or repair the work without additional cost to the Owner.

3. Immediately correct defective work, including defective work discovered during warranty period, to the satisfaction of the Owner and the Architect.

PART 2 - PRODUCTS

2.1 ON-SITE PIPING

A. Piping:

1. Type: Bell and spigot rubber ring polyvinyl chloride (PVC) water pipe conforming to AWWA C-900 for sizes 4 inch through 12 inch diameter.
2. Type: PVC friction fit pipe conforming to ASTM D 1785, Schedule 80, for sizes less than 4 inches in diameter.
3. Pressure Class: Class 235 and 305 per AWWA C-900 standard, U.L. listed.

B. Minimum Coverage: 36 inches for sizes 3 inches and greater in diameter. Provide minimum 24 inch cover for pipe less than 3 inches in diameter.

C. Fittings:

1. Metal:
 - a. Provide galvanized cast iron mechanical fittings, Pressure Class 235 and 305, meeting AWWA C-110, C-111, and C-153 standard, U.L. listed, for sizes up to and including 2 inches in diameter. Coat with bituminous coating as specified.
 - b. Provide ductile iron mechanical fittings, Pressure Class 235 and 305, meeting AWWA C-110, C-111, and C-153 standard, U.L. listed, for sizes 2.5 to 12 inches in diameter. Coat with bituminous coating as specified.
2. PVC: Provide solvent weld fittings from same manufacturer as pipe, Schedule 80, conforming to ASTM D 2466 for sizes less than 4 inches in diameter.

2.2 BACKFLOW PREVENTER

A. Manufacturer:

1. Specification is based on products of listed manufacturer. Other manufacturers may be approved per procedures specified in Section 01610, including approval by serving jurisdictional authority.

B. Characteristics:

1. Provide Model

2.3 ON-SITE FIRE HYDRANTS

A. Manufacturer: Jones or approved equal.

1. Characteristics:

- a. Provide Model 3775, all bronze, wet barrel units with 6 inch flanged inlet, two 4 inch steamer outlet and one 2-1/2 inch hose outlet conforming to AWWA C-503.
- b. Accessories: Provide chained caps and operating wench.
- c. Buries: Cast iron unit with 6" mechanical joint inlet and 6" flanged outlet.

2.4 VALVES

A. Manufacturer: Clow-Rich, Mueller, American Darling, Stockham and Kennedy.

B. Characteristics:

1. Provide flanged cast iron gate valve, with resilient seat, bronze N.R.S., and conforming to AWWA C-509 for sizes 3 to 12 inches in diameter. Coat with bituminous coating as specified.
2. Provide bronze gate valve with handwheel shutoff for sizes 2 inches and less.
3. Accessories: Square wrench nut and operating wrench.

C. Meter Box: Provide Brooks or equal, 20 x 36 inch precast concrete meter box, with reading lid.

D. Valve Box: Provide cast iron well cap cover with the word "WATER" cast in cover. Provide minimum 8 inch I.D. cast iron, ductile iron, or PVC Pressure Class 235 pipe riser. Coat ferrous materials with bituminous coating as specified

E. Valve Box: Provide Alhambra Foundry A-3000 three piece cast iron valve box with extension and drop cover. Provide the word "WATER" cast in cover.

F. Check Valve:

1. Domestic Water: AWWA C508, iron body, bronze trim, renewable disc and seat, flanged ends.
2. Fire Water: UL Listed/F.M. Approved, iron body, bronze trim, renewable disc and seat, flanged ends. Obtain approval of all valves located on fire lines by serving jurisdictional authority.

2.5 CONCRETE MATERIALS

A. Anchor, thrust and valve blocks: Concrete as specified in Section 033010, 2500 psi, installed per VID Standard Drawing 5-5, 5-6, 5-7, and 5-8, respectively.

2.6 FIRE DEPARTMENT CONNECTION

A. Manufacturer: BRECCO, or approved equal

1. Specification is based on products of listed manufacturer. Other manufacturers may be approved per procedures specified in Section 016000, including approval by serving jurisdictional authority.

B. Characteristics:

1. Type: Free standing type, brass finish, with ductile iron pedestal.
2. Outlets: Provide two 2-1/2 inch to suit Fire Department hardware, with threaded dust cap and chain of matching material and finish.
3. Label: "Building (insert building number) Sprinkler - Fire Department Connection."

2.7 POST INDICATOR VALVE

A. Manufacturer: Mueller or approved equal.

1. Specification is based on products of listed manufacturer. Kennedy, Clow Valve or other manufacturers may be approved per procedures specified in Section 016000, including approval by serving jurisdictional authority.

B. Characteristics:

1. Type: Model A-20806, vertical type, ductile iron body with large window opening indicating OPEN or SHUT valve position. Protect working parts of stem and indicator with weatherproof enclosure. Provide operating nuts and wrench.
2. Provide connection for electrical tamper/monitoring switch. Coordinate with work specified in Division 16.

2.8 WATER METER

A. Manufacturer:

1. Acceptable manufacturers include Mueller/Hershey and Neptune. Specification is based on products of listed manufacturer. Other manufacturers may be approved per procedures specified in Section 016000, including approval by serving jurisdictional authority.

B. Characteristics:

1. Provide Model: to be provided by Water Authority

2.9 DETECTABLE WARNING/IDENTIFICATION TAPE

- A. Tape shall be an inert, non-metallic plastic film formulated for prolonged underground use that will not degrade when exposed to alkalis, acids and other destructive substances commonly found in soil.
- B. Tape shall be puncture-resistant and shall have an elongation of two times its original length before parting.
- C. Tape shall be colored to identify the type of utility intended for identification. Printed message and tape color shall be as follows: "Caution Waterline Buried Below", Blue
- D. Ink used to print messages shall be permanently fixed to tape and shall be black in color with message printed continuously throughout.

- E. Tape shall be minimum 0.102mm (0.004" or 4 mil) thick x 150mm (6") wide with a printed message on one side. Tape used with the installation of onsite potable and recycle water irrigation systems shall be a minimum of 75mm (3") wide.

2.10 OTHER MATERIALS

- A. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to work of this section, carefully inspect previously installed work. Verify all such work is complete to the point where this installation may properly commence.
2. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
 - a. Verify that survey benchmark and intended elevations for the Work are as indicated.
 - b. Identify required lines, levels, contours, and datum.
 - c. Identify known utilities. Stake and flag locations.
 - d. Maintain and protect existing utilities remaining which pass through work area.
3. In the event of discrepancy, immediately notify the Architect.
4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

B. Preparation

1. Provide all staking and field engineering required to implement the work as shown on the drawings.
2. Protect all stakes and benchmarks. Replace all stakes and benchmarks damaged during the course of construction at no cost to Owner.
3. Set grade stakes using instrument technology, at 50 foot grid interval at areas with gradients greater than 2 percent.
4. Set grade stakes, using instrument technology, at 25 foot grid interval at areas with gradients less than 2 percent.
5. Provide all equipment of such type, function and design as required to achieve specified values.

3.2 PIPING INSTALLATION

- A. Provide all required excavation, shoring and backfilling required for the proper installation of buried pipe lines and related material and equipment in accordance with this Section and Section 312000 and Section 315000.
- B. Temporary barricades, warning lights, covers, railings and other protection or warning devices shall be maintained by the Contractor while the trenches are open.
- C. See Section 312000 for scheduling and review requirements.
- D. See Section 311000 for protection and repair of existing utilities and surfaces. Repair and/or replace all piping, conduits and appurtenances damaged by the work.
- E. Separation
 - 1. All new water lines shall be located 10-foot horizontally from, and one foot vertically above, any parallel sewer, recycled water, or fuel pipeline.
 - 2. If crossing a pipeline conveying sewer, recycled water, storm drainage, or fuel; a new water main shall be constructed no less than 45-degrees to and at least one foot above that pipeline. No connection joints shall be made in the water main within eight horizontal feet of the fluid pipeline.
 - 3. For alternative configurations or where a sewer line crosses above a water main, reference "California Regulations Related to Drinking Water" document per Section 1.2 for additional requirements.
- F. Provide clamps and/or concrete thrust blocks at elbows, tees and other points where separation might occur in polyvinyl chloride piping.
- G. Anchor valves in polyvinyl chloride pipe with 5/8 inch diameter rods embedded 18 inches in 8 square foot by 2 foot thick concrete base.
- H. Make below grade flanged connections with stainless steel bolts, nuts and washers. Do not bury flanges of valves; form approved pit.
- I. Set access boxes flush with finished grade.
- J. Coat all below grade boxes, mechanical joints and bolts with two coats of Koppers Bitumastic No. 50 coating.
- K. Flush fire service piping in compliance with N.F.P.A. Standard No. 24 in presence of the Fire Department Representative. Notify Fire Department minimum 48 hours prior to the scheduled flushing.
- L. Flush and disinfect all domestic and potable water lines in accordance with AWWA C-651. Apply chlorine by continuous feed method
 - 1. Isolate systems requiring disinfection from existing water systems remaining in service with an in-line valving system approved by serving jurisdictional authority and Architect.
- M. Deliver Record Drawings in accordance with Section 017100.
- N. Provide Fire Department Connection in compliance with serving jurisdictional authority criteria, manufacturer's instructions and NFPA 13.

1. Install buried shut-off check valves, in valve box. Provide post indicator valve.
2. Install post indicator valve with bolts through base flange as recommended by manufacturer. Set valve vertical.
3. Locate fire department connection with sufficient clearance from walls, obstructions or adjacent siamese connectors to allow full swing of fire department wrench handle.

3.3 DETECTABLE WARNING/IDENTIFICATION TAPE INSTALLATION

- A. Warning/Identification Tape shall be installed as described below and in accordance with the Standard Drawings.
 1. Tape shall be placed at the top of the pipe zone 300mm (12") above and centered over the utility intended for identification. Tape used with onsite potable and recycled water irrigation systems shall be installed at 150mm (6") above the pipe. B.
 2. Tape shall be installed with the printed side up and run continuously along the entire length of the utility intended for identification. Tape shall be installed on the main piping and all appurtenant laterals, including blowoffs, air valve assemblies, fire hydrants, and services. Tape splices shall overlap a minimum of 600mm (24") for continuous coverage.
 3. Tape shall be installed prior to placement of the Trench Zone Backfill.

3.4 PAINTING AND MARKING

- A. Paint all above grade water service items, including detector check and backflow preventor assembly with VOC approved coatings per jurisdictional authority Department requirements.
- B. Paint all above grade fire service items, including fire department connection, post indicator valves and hydrants with VOC approved coatings per jurisdictional authority Department requirements.
- C. Where required by Fire Department, provide reflectorized pavement markers at each hydrant, located as directed by Fire Department.

3.5 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 014000.
- B. Request architect to inspect pipe prior to covering. Notify Fire Department minimum 48 hours prior to the scheduled testing.
- C. Test pipe system for leakage prior to covering but after thrust blocking and valves are in place. Allow thrust blocking to cure for minimum 7 days prior to commencing test procedures.
 1. Isolate system by closing valves where available and install temporary bulkheads where valves do not occur.
 2. Open air valves and fill system with water. Allow system to stand under slight pressure for 24 hours to dissipate trapped air.

3. Correct noticeable leakage at valves, fittings, temporary bulkheads, and other connections.
 - a. Where leakage continues at valves and bulkheads, provide means of measuring volume of leakage.
4. Induce pressure of 150 psi (for domestic water lines) measured at lowest point of system; maintain pressure for 4 hours. Induce pressure of 200 psi (for fire service lines) measured at lowest point of system; maintain pressure for 2 hours.
 - a. Measure volume of water required to maintain pressure
 - b. Leakage to be volume required to maintain pressure less volume of leakage at valves and bulkheads.
 - c. Allowable leakage not to exceed 25 gallons per inch of pipe diameter per mile per 24 hours.
5. Replace unacceptable sections of pipe, fittings, and appurtenance until subsequent test results fall within allowable limits.

3.6 CLEAN-UP

- A. Remove all surplus material, rubbish and debris in accordance with Section 017719.

END OF SECTION 331116

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SECTION 333100

SANITARY UTILITY SEWERAGE SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Sanitary sewer piping, fittings, and accessories.
- B. Manholes, cleanouts, and miscellaneous system components.

1.2 REFERENCES

- A. ASTM D3034 - Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.
- B. Applicable portions of Uniform Plumbing Code for materials and installation of the Work of this Section.
- C. ASTM C 700-97 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- D. ASTM C 425-98b - Compression Joints for Vitrified Clay Pipe and Fittings.
- E. Standard Specifications for Public Works Construction (SSPWC) ("Green Book"), 2015 Edition
State of California, Department of Transportation (CalTrans) Standard Specifications, latest edition as adopted by serving jurisdictional authority.
- F. Regional Standard Drawings, 2016 edition, as amended by serving jurisdictional authority.
- G. State Water Resources Control Board's Division of Drinking Water, "California Regulations Related to Drinking Water" (CCR, Title 22), latest published edition.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable regulations published by jurisdictional authority regarding flood control and storm water drainage and discharge.
- B. Conform to applicable regulations of the California Plumbing Code, Part 5, Title 24, CCR for installation of sanitary sewer system.

1.4 PUBLIC AGENCY STANDARDS

- A. Perform all work and related structures and devices indicated in accordance with the Regional Standards Drawings as indicated on the plans and these specifications and the Standard Specifications for Public Works Construction (SSPWC) "Green Book", 2016 Edition

B. Provide water main separation per “Guidance Memo No. 2003-02: Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines” by the State of California Department of Health Services dated October 16, 2003, and subsequent updates.

1.5 QUALITY ASSURANCE:

A. Contractor Qualifications

1. Installing Company: Company specializing in installation of storm drainage systems, with minimum 5 years documented experience in installation of projects of similar scale and scope.
2. Installing Foreman: Individual specializing in installation of storm drainage systems, with minimum 5 years documented experience in installation of projects of similar scale and scope.
3. Use only staff who are completely familiar with the manufacturers' recommended methods of installation as well as the requirements of this work.

1.6 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 013000.

B. Accurately record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

1.7 TESTS

A. Public Sewer Connection: Make connections to existing public sewers in accordance with the Standard Specifications.

B. Leakage Testing: Tests for leakage will be conducted as indicated in the Standard Specifications or as specified.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. PVC Pipe:

1. 4 inch - 12 inch diameter: ASTM D 3034, Type PSM SDR 35, bell and spigot end configurations for elastomeric gaskets.

Force Mains: Schedule 80 per ASTM D1785 with solvent welded joints per ASTM D 2235

2.2 PIPE ACCESSORIES

A. PVC Fittings: Same material as pipe, molded, or formed to suit pipe size and end design, in required 'T', bends, elbows, reducers, traps, and other connections.

B. Joint Gaskets: ASTM F 477

C. Cleanouts - Paving areas: J. R. Smith or equal, 4240/37 Series, scoriated cast-iron lid, tractor type, set flush with surface, with vandal proof screw.

D. Cleanouts - Landscaped/planting areas: J. R. Smith or equal, 4220/4231 Series, scoriated cast-iron lid, set flush with surface, with vandal proof screw.

2.3 BEDDING/BACKFILL MATERIAL

A. As specified in Section 310000 and Section 312000.

B. Force Mains: see section 221113

2.4 MANHOLES

A. Provide Ameron or equal manhole sections, cones, and grade rings.

B. Cast-in-Place concrete as specified in Section 033000, configuration as indicated on the Drawings.

C. Frame and grate or lid as indicated on the Drawings. Where not indicated, comply with referenced Standard Plans/Drawings.

2.5 DESIGN CRITERIA

A. General

1. All improvements shall be constructed per the referenced standards, the contract documents, and as specified in this section.

2. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, the more stringent criteria shall apply.

2.6 DETECTABLE WARNING/IDENTIFICATION TAPE

1. Tape shall be an inert, non-metallic plastic film formulated for prolonged underground use that will not degrade when exposed to alkalis, acids and other destructive substances commonly found in soil.
2. Tape shall be puncture-resistant and shall have an elongation of two times its original length before parting.
3. Tape shall be colored to identify the type of utility intended for identification. Printed message and tape color shall be as follows: "Caution Sewer line Buried Below", Green
 - a. Ink used to print messages shall be permanently fixed to tape and shall be black in color with message printed continuously throughout.

4. Tape shall be minimum 0.102mm (0.004" or 4 mil) thick x 150mm (6") wide with a printed message on one side. Tape used with the installation of onsite potable and recycle water irrigation systems shall be a minimum of 75mm (3") wide.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to work of this section, carefully inspect previously installed work. Verify all such work is complete to the point where this installation may properly commence.
2. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
 - a. Verify that survey benchmark and intended elevations for the Work are as indicated.
 - b. Identify required lines, levels, contours, and datum.
 - c. Identify known utilities. Stake and flag locations.
 - d. Maintain and protect existing utilities remaining which pass through work area.
3. In the event of discrepancy, immediately notify the Architect.
4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION

- A. Provide all staking and field engineering required to implement the work as shown on the drawings.
- B. Protect all stakes and benchmarks. Replace all stakes and benchmarks damaged during the course of construction at no cost to Owner.
- C. Set grade stakes using instrument technology, at 50 foot grid interval at areas with gradients greater than 2 percent.
- D. Set grade stakes, using instrument technology, at 25 foot grid interval at areas with gradients less than 2 percent.
- E. Provide all equipment of such type, function and design as required to achieve specified values.
- F. Connection criteria
 1. Before trenching, verify the horizontal location and invert elevations of all sanitary sewer connection points, and the horizontal location of all other utility lines.
 2. Reconstruct, repair, or replace all pavements, sidewalk, landscape and other items to the satisfaction of the jurisdictional authority.

3. Arrange for the marking of all utility lines in all areas of trenching and excavation operations. See Section 311200.

3.3 INSTALLATION – PIPE

- A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal joints tight.
- B. Lay pipe on bedding and to slope gradients noted on drawings. Begin construction at lowest point of connection or discharge and lay continuously upstream.
- C. Lay bell and spigot or tongue and groove pipe with bell end or groove end upstream.
- D. Install additional bedding at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches.
- E. Backfill trench in accordance with the provisions of Section 312000.
- F. Separation
 - 1. All new site water mains shall be located 10-foot horizontally from, and one foot vertically above, any parallel sewer or recycled water pipeline.
 - 2. All new site water mains crossing a sewer or recycled water pipelines in a perpendicular fashion shall be located a minimum of one-foot above the crossed line. No connection joints shall be made in the water main within eight horizontal feet of the crossed line.
 - 3. For alternative configurations or where a sewer line crosses above a water main, reference "California Regulations Related to Drinking Water" document per Section 1.2 for additional requirements.
- G. Unless specifically noted otherwise, provide all required concrete work such as pads, bases and kick blocks.
- H. Dielectric Isolators: Where incompatible piping materials come in contact except for the use of valves, isolate from each other with dielectric unions, line size.
- I. Provide sleeves for all piping crossing walls or footings. Provide Architect approved seals at all footing sleeves to prevent water migration.

3.4 INSTALLATION – MANHOLES AND CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast in place concrete at bottom of manhole, shaped as shown on drawings.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Mount lid and frame level at elevation indicated.
- E. Provide minimum 12 inch clearance on all sides at excavation for manholes and similar structures.

3.5 PROTECTION

- A. Protect finished installation from all potential damage.

3.6 DETECTABLE WARNING/IDENTIFICATION TAPE INSTALLATION

Warning/Identification Tape shall be installed as described below and in accordance with the Standard Drawings.

- A. Tape shall be placed at the top of the pipe zone 300mm (12") above and centered over the utility intended for identification. Tape used with onsite potable and recycled water irrigation systems shall be installed at 150mm (6") above the pipe. B.
- B. Tape shall be installed with the printed side up and run continuously along the entire length of the utility intended for identification. Tape shall be installed on the main piping and all appurtenant laterals, including blowoffs, air valve assemblies, fire hydrants, and services. Tape splices shall overlap a minimum of 600mm (24") for continuous coverage.
- C. Tape shall be installed prior to placement of the Trench Zone Backfill.

3.7 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 014000.

B. Alignment Inspection

1. The Contractor shall check the alignment of private sewer lines when backfill has reached the top of the pipe. Both external and internal inspections for alignment may be made at this time.
2. Correct, to the IOR's satisfaction, any section of the line found to be unsatisfactory in material, alignment, grade, or joints

C. Leakage Testing

1. After alignment tests are completed, and before flows are allowed in the line, conduct leakage tests in accordance with Greenbook Specifications.
2. Test entire private sewer system for leakage/exfiltration in the presence of the IOR.
3. Conform to requirements of the "Standard Specifications" for exfiltration limits.

D. Video Inspections

1. Inspect interior of piping with closed circuit television (CCTV) to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project, prior to occupancy.
2. Prior to videotaping, pipes should be jetted to remove all debris. During videoing, provide running water through pipe to identify low points. Immediately fix any damaged sections or low points. Provide complete video inspection to IOR for review and approval.

END OF SECTION 333100

SECTION 334100

STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This Section includes gravity-flow, non-pressure storm drainage outside the building, with the following components:
 - 1. Special fittings for expansion and deflection cleanouts.
 - 2. Cleanouts.
 - 3. Drains.
 - 4. Precast concrete and Cast-in-place concrete manholes.

1.2 RELATED DOCUMENTS/REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Geotechnical Report: "PROPOSED BALBOA LIBRARY AND FIRE STATION NO. 1; 100 AND 110 EAST BALBOA BOULEVARD NEWPORT BEACH, CALIFORNIA; PROJECT NO. W1729-88-01 dated APRIL 4, 2024 prepared by GEOCON, including any subsequent addenda
- C. Standard Specifications for Public Works Construction ("Greenbook"), 2015 edition
- D. California Department of Industrial Relations, Division of Occupational Safety and Health (CALOSHA)

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. HDPE: High-Density Polyethylene.
- D. PE: Polyethylene plastic.
- E. PVC: Polyvinyl chloride plastic.
- F. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be at least silt tight, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Special pipe fittings.
 - 2. Drains.
 - 3. Channel drainage systems.
- B. Shop Drawings: For the following:
 - 1. Manholes: Include plans, elevations, sections, details, and frames and covers.
 - 2. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, and frames, covers, and grates.
 - 3. Pump and Wet well: Include plans, elevations, sections, details
 - 4. Treatment System: Include plans, elevations, sections, details
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- D. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.3 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252M, Type S, with smooth waterway for coupling joints.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294M, Type S, with smooth waterway for coupling joints.

2.4 PVC PIPE AND FITTINGS

- A. PVC Pressure Pipe: AWWA C900, Class 100, for gasketed joints and using ASTM F 477, elastomeric seals.
 1. Fittings NPS 4 to NPS 8: PVC pressure fittings complying with AWWA C907, for gasketed joints and using ASTM F 477, elastomeric seals.
 2. Fittings NPS 10 and Larger: Ductile-iron, compact fittings complying with AWWA C153, for push-on joints and using AWWA C111, rubber gaskets.
- B. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- C. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794 pipe, with bell-and-spigot ends; ASTM D 3034 fittings, with bell ends; and ASTM F 477, elastomeric seals.

2.5 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Concrete Pipes: ASTM C 443, rubber.
 - 2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded Flexible Couplings: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers, or approved equal:
 - a. Fernco Inc.
 - b. Mission Rubber Company; a division of MCP Industries, Inc.
 - c. NDS Inc.
 - d. Plastic Oddities, Inc.
- D. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers, or approved equal:
 - a. Cascade Waterworks Mfg.
 - b. Mission Rubber Company; a division of MCP Industries, Inc.
- E. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.
 - 1. Manufacturers, or approved equal:
 - a. Fernco Inc.
 - b. Mission Rubber Company; a division of MCP Industries, Inc.
- F. Nonpressure-Type Rigid Couplings: ASTM C 1461, sleeve-type reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers, or approved equal:
 - a. ANACO.

2.6 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 - 1. Manufacturers, or approved equal:
 - a. Smith, Jay R. Mfg. Co.
 - b. Watts Industries, Inc.
 - c. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
 - 2. Top-Loading Classification(s): Medium and Extra Heavy duty.
 - 3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.
 - 1. Manufacturers, or approved equal:
 - a. IPS Corporation.
 - b. NDS Inc.
 - c. Zurn Industries, Inc.; Zurn Light Commercial Specialty Plumbing Products.

2.7 DRAINS

- A. Gray-Iron Area Drains: ASME A112.21.1M, round body with anchor flange and round grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
 - 1. Manufacturers, or approved equal:
 - a. Smith, Jay R. Mfg. Co.
 - b. Watts Industries, Inc.
 - c. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
 - 2. Top-Loading Classification(s): Medium and Extra Heavy duty.
- B. Gray-Iron Trench Drains: ASME A112.21.1M, 6-inch- wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular grate. Include units of total length indicated and number of bottom outlets with inside calk or spigot connections, of sizes indicated.
 - 1. Manufacturers, or approved equal:
 - a. Smith, Jay R. Mfg. Co.

- b. Wade Div.; Tyler Pipe.
 - c. Watts Industries, Inc.
 - d. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
2. Top-Loading Classification(s): Medium and Extra Heavy duty.

2.8 MANHOLES

- A. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
- 1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 - 2. Resilient Pipe Connectors: **ASTM C 923**, cast or fitted into manhole walls, for each pipe connection.
 - 3. Steps: ASTM A 615/A 615M, deformed, **1/2-inch** steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at **12- to 16-inch** intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 **inches**.
 - 4. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
 - 5. Grade Rings: Reinforced-concrete rings, **6- to 9-inch** total thickness, to match diameter of manhole frame and cover.
 - 6. Manhole Frames and Covers: Ferrous; **24-inch** ID by **7- to 9-inch** riser with **4-inch-** minimum width flange and **26-inch-** diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM DRAIN."
 - a. Material: ASTM A 48, Class 35 gray iron, unless otherwise indicated.
 - b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; **10-mil** minimum thickness applied to all surfaces, unless otherwise indicated.
- B. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
- 1. Diameter: 48 inches minimum, unless otherwise indicated.
 - 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 - 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 - 4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.

5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
 8. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 36 inches.
 9. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
 10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
 11. Protective Coating: Plant-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint, 15-mil minimum thickness applied to exterior and interior surfaces.
 12. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
 - a. Material: ASTM A 536, Grade 60-40-18 ductile iron, unless otherwise indicated.
 - b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; 15-mil minimum thickness applied to all surfaces, unless otherwise indicated.
- C. Designed Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole, as required to prevent flotation.
 2. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 3. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
 4. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.
 5. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
 6. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.

7. Protective Coating: Plant-applied, SSPC-Paint 16; 10-mil minimum thickness applied to interior surfaces.
8. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
 - a. Material: ASTM A 48, Class 35 gray iron, unless otherwise indicated.
 - b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; 10-mil minimum thickness applied to all surfaces, unless otherwise indicated.

2.9 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
 1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.
 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.10 CATCH BASINS

- A. Standard Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
 1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
 3. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 5. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
 6. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
 7. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 48 inches.
 8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
 2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
 3. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
 4. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 48 inches.
 5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Bottom, Walls, and Top: Reinforced concrete.
 2. Channels and Benches: Concrete.
 3. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 48 inches.
- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
1. Size: 24 by 24 inches minimum, unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

- E. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter flat grate with small square or short-slotted drainage openings.
 - 1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.11 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.
- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy-duty frames and grates according to utility standards.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING APPLICATIONS

- A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
 - a. Unshielded flexible or rigid couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 - 2. Use pressure-type pipe couplings for force-main joints.
- B. Special Pipe Fittings: Use for pipe expansion and deflection. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- C. Gravity-Flow, Nonpressure Sewer Piping: Use the following pipe materials for each size range:
 - 1. NPS 3 to NPS 4: PVC water-service pipe; PVC Schedule 40, water-service-pipe fittings; and solvent-cemented joints.

2. NPS 4 to NPS 8: SDR-42 PVC sewer pipe and fittings, gaskets, and gasketed joints.
3. NPS 6 to NPS 36: Corrugated HDPE drainage pipe and fittings silttight couplings, and coupled joints.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing storm sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
 2. Install piping with 24-inch minimum cover.
 3. Install HDPE corrugated drainage piping according to Greenbook Standards and Manufacturers recommendations.
 4. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

3.4 PIPE JOINT CONSTRUCTION

- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure drainage piping according to the following:
 1. Join corrugated PE piping according to CPPA 100 and the following:
 - a. Use silttight couplings for Type 2, silttight joints.
 - b. Use soiltight couplings for Type 1, soiltight joints.
 2. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.

3. Join dissimilar pipe materials with nonpressure-type flexible or rigid couplings.

3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 1. Use medium-duty, top-loading classification cleanouts in earthen and paved foot-traffic areas.
 2. Use extra-heavy-duty, top-loading classification cleanouts in vehicle traffic service areas and roads.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.6 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
 1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 2. Use heavy-duty, top-loading classification cleanouts in paved foot-traffic areas and vehicle-traffic service areas.
- B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections according to ASTM C 891.
- C. Construct cast-in-place manholes as indicated.
- D. Install PE sheeting on earth where cast-in-place-concrete manholes are to be built.
- E. Install FRP manholes according to manufacturer's written instructions.

- F. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

3.8 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.9 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318/318R.

3.10 DRAINAGE SYSTEM INSTALLATION

- A. Assemble and install components according to manufacturer's written instructions.
- B. Install with top surfaces of components, except piping, flush with finished surface.
- C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- E. Fasten grates to channel sections if indicated.
- F. Assemble channel sections with flanged or interlocking joints.
- G. Embed channel sections in 4-inch minimum concrete around bottom and sides.

3.11 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."
- B. Connect to sediment interceptors specified in Division 22 Section "Sanitary Waste Interceptors."

3.12 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

3.13 PAINTING

- A. Clean and prepare concrete manhole surfaces for field painting. Remove loose efflorescence, chalk, dust, grease, oils, and release agents. Roughen surface as required to remove glaze. Paint the following concrete surfaces as recommended by paint manufacturer:
 - 1. Cast-in-Place-Concrete Manholes: All interior.
 - 2. Precast Concrete Manholes: All interior.
- B. Prepare ferrous frame and cover surfaces according to SSPC-PA 1 and paint according to SSPC-PA 1 and SSPC-Paint 16. Do not paint surfaces with foundry-applied, corrosion-resistant coating.

3.14 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.15 FIELD QUALITY CONTROL

- A. Inspect interior of piping with closed circuit television (CCTV) to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project, prior to occupancy.
 - 1. Submit separate videos and reports for each system inspection to review and approval by the Inspector of Record.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to Greenbook Specification Section 306-1.4 for Air Testing.
 3. Notify Districts Inspector of Record for scheduled tests and inspections with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to ASTM C 924.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.16 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334100

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