

ANTELOPE VALLEY COLLEGE PALMDALE AIRPORT TERMINAL REMODEL

21000 20TH STREET EAST, PALMDALE, CA 93550

for ANTELOPE VALLEY COMMUNITY COLLEGE DISTRICT
3041 WEST AVENUE K • LANCASTER, CALIFORNIA 93536-5436

PROJECT MANUAL

AUGUST 15, 2016 • KBZ JOB NO. 16-018

Owner: ANTELOPE VALLEY COLLEGE COMMUNITY COLLEGE DISTRICT
3041 West Avenue K • Lancaster, CA 93536-5426 • Phone (661) 722-6300



Architect: KRUGER BENSEN ZIEMER ARCHITECTS, INC.
30 W Arrellaga St • Santa Barbara, CA 93101
Phone (805) 963-1726 • Fax (805) 963-2951

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SPECIFICATION MANUAL
for the
ANTELOPE VALLEY COLLEGE
PALMDALE AIRPORT TERMINAL REMODEL

KRUGER BENSEN ZIEMER ARCHITECTS, INC.
30 West Arrellaga Street. Santa Barbara, CA 93101

Principal Architect	License No.	Stamp
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STRUCTURAL ENGINEER
KANDA AND TSO
511 Mission Street, South Pasadena, CA 91030

Project Engineer	License No.	Stamp
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MECHANICAL ENGINEER:
dHA + CALPEC
105 South Arroyo Parkway Suite 100, Pasadena, CA 91105

Project Engineer	License No.	Stamp
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ELECTRICAL ENGINEER:
dHA + CALPEC
105 South Arroyo Parkway Suite 100, Pasadena, CA 91105

Project Engineer

License No.

Stamp

**SPECIFICATIONS MANUAL
for
ANTELOPE VALLEY COLLEGE
PALMDALE AIRPORT TERMINAL REMODEL
21000 20TH STREET EAST
Palmdale, California 93550**

DISTRICT: BOARD OF EDUCATION
Antelope Valley Community College District
3041 West Avenue K
Lancaster, CA 93536
(661) 722-6300

ARCHITECT: KRUGER BENSEN ZIEMER ARCHITECTS, INC.
30 West Arrellaga Street
Santa Barbara, CA 93101
(805) 963-1726
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STRUCTURAL ENGINEER: KANDA & TSO ASSOCIATES
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SECTION 011000 – SUMMARY

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by contract documents.
3. Owner-furnished products.

1.2 PROJECT INFORMATION

A. Project Identification: Antelope Valley College – Palmdale Airport Terminal Remodel

1. Project Location: 21000 20th Street East, Palmdale Ca 93550

B. District: Antelope Valley Community College District, 3041 West Avenue K, Lancaster, CA 93536-5426

1. District's Representative: Mr. Doug Jensen (661) 722-6526

C. Architect: Kruger Bensen Ziemer Architects, Inc., Steven E. Dowty, AIA, 30 W. Arrellaga St., Santa Barbara, CA 93101, (805) 963-1726

D. Other District Consultants:

1. Structural: Kanda and Tso Associates, Les Tso, 511 Mission St., South Pasadena, CA 91030, (626) 441-1211
2. Mechanical: DHA+CALPEC Kevin Chen, 150 S Arroyo Parkway, Suite 100, Pasadena, CA 91105, (626) 445-8580
3. Electrical: DHA+CALPEC, Andrew Injo, 150 S Arroyo Parkway, Suite 100, Pasadena, CA 91105, (626) 445-858

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work of the Project: Remodel conversion of a Palmdale Airport Terminal into temporary lab classrooms and offices being used by Antelope Valley College. Total interior square footage consist of 8,873 square feet, with approximately 3,241 square feet being used for a Structures Lab and equipment space and 1,058 square feet being used as a classroom with 24 work stations. Four (4) new air compressors will be installed along with a new exhaust fan to service the Structures Lab.

- B. Type of Contract: General Contract.
- C. Phased Construction: Single phase.
- D. Use of Site: Limited to work in areas indicated.
 - 1. Use by public allowed on all areas outside those indicated by construction fencing.
- E. Work Restrictions: No work between the hours of 7 PM and 7AM. No work on Sundays.

1.4 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.
- B. Owner-Furnished Products:
 - 1. Air compressor identified on drawings.
 - a. Arrange for pick-up and delivery of equipment to the site. The equipment is located within 30 miles of the construction site.
 - b. Prior to pick-up the District will provide documentation for the transfer of the equipment. The documentation will include a statement that the existing condition of the equipment is in working, operational order.
 - c. Inspect the equipment at pick-up site. Notify the Architect immediately if the equipment is damaged, unavailable or appears non-operational, and do not transfer the equipment until resolution.
 - d. Transfer the equipment, secured and protected from all possible damage, to the construction site.
 - e. Install the equipment according to drawings and specifications.

END OF SECTION 011000

SECTION 012500 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Sections:
 - 1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
 - 2. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A facsimile of form provided in the Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by District and separate contractors, that will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from California Building Code (CBC) 2007 Edition.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

- B. Approval: Substitutions affecting items regulated by the Division of the State Architect (DSA) will be considered changed to approved plans or specifications. They are to be treated as addenda or change orders, and will require DSA approval prior to fabrication and installation.

1.6 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers District a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities District must assume. District's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by District, and similar considerations.

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

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

Substitution Request

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Section Page	Paragraph	Description
The undersigned requests consideration of the following:		
PROPOSED SUBSTITUTION: _____		

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents which the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering or architectural design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The proposed substitution will not result in an increase to the Contract Price or the Contract Time.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

Signature _____

For use by Architect

Firm _____

Accepted

Address _____

Accepted as noted

Not Accepted

Received too late

By _____

Date _____

Date _____

Telephone _____

Remarks _____

Attachments:

Substitution Request Form

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SECTION 012550 - REQUEST FOR INFORMATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Work Included in This Section: Procedures to be followed by Contractor upon discovery of apparent errors, conflicts, or omissions in the Contract Documents, or upon having questions concerning interpretation.

1.3 PROCEDURES

- A. Notification by the Contractor:
 - 1. Submit requests for clarification or additional information in writing to the Architect using the Request for Information (RFI) form provided by the Architect or a similar form approved by the Architect.
 - 2. Number RFI's sequentially. Unless Architect directs otherwise, follow RFI number with sequential alphabetical suffix as necessary for each resubmission. For example, the first RFI would be 001. The Second would be 002. First resubmittal of RFI 002 would be 002A.
 - 3. Limit each RFI to one subject.
 - 4. Submit RFI's if one of the following conditions occur:
 - a. Contractor discovers an unforeseen condition or circumstance that is not described in the Contract Documents.
 - b. Contractor discovers an apparent conflict or discrepancy between portions of the Contract Documents that appears to be inconsistent or is not reasonably inferred from the intent of the Contract Documents.
 - c. Contractor discovers what appears to be an omission from the Contract Documents that cannot be reasonably inferred from the intent of the Contract Documents.
 - 5. RFI's will not be recognized or accepted if, in the opinion of the Architect, one of the following conditions exist:
 - a. Contractor submits the RFI as a request for substitution.

- b. Contractor submits the RFI as a submittal.
 - c. Contractor submits the RFI under the pretense of a discrepancy or omission in the Contract Documents without a thorough review of the Contract Documents.
 - d. Contractor submits the RFI in a manner that suggests that specific portions of the Contract Documents are assumed to be excluded or by taking an isolated portion of the Contract Documents in part rather than in their entirety.
 - e. Contractor submits an RFI in an untimely manner without proper coordination and scheduling of Work or related trades.
6. Ask for clarification or request information immediately upon discovery. Submit RFI's in a reasonable time frame so as not to affect the Contract Schedule while allowing the full response time described below.
- B. Response Time:
- 1. Architect, whose decision will be final and conclusive, shall resolve such questions and issue instructions to the Contractor within 14 days after receipt. In some cases time may need to be longer for complex issues or shortened for emergency situations, as mutually agreed between Architect and Contractor.
 - 2. Should Contractor proceed with the Work affected before receipt of a response from Architect, within the response times described above or as agreed, any portion of the Work which is not performed in accordance with the Architect's interpretations, clarifications, instructions, or decisions is subject to removal or replacement, and Contractor shall be responsible for all resultant losses and costs.
- C. Failure to Agree: In event of failure to agree as to the scope of the Contract requirements, Contractor shall follow procedures set forth concerning Claims in the General Conditions.

1.4 COSTS INCURRED

- A. Costs incurred by Owner for professional services shall be paid by Contractor as specified in the General Conditions.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 012550

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

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

1.4 PROPOSAL REQUESTS

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

- e. Quotation Form: Use CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail or other forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 7. Proposal Request Form: Use CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail." or other form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 013200 "Construction Schedule" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than **fourteen** days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:

- a. Project name and location.
 - b. School District's name and address.
 - c. Name of Architect.
 - d. Architect's project number.
 - e. Contractor's name and address.
 - f. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
 7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit Application for Payment to Architect by the **tenth** day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required. All copies to be signed by the Inspector of Record (IOR).
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Submittal schedule (preliminary if not final).
 5. List of Contractor's staff assignments.
 6. List of Contractor's principal consultants.
 7. Report of preconstruction conference.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Updated final statement, accounting for final changes to the Contract Sum.
 3. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 4. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 5. AIA Document G707, "Consent of Surety to Final Payment."
 6. Evidence that claims have been settled.
 7. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Division 0 Specification Sections, Division 1 Specification Sections apply to this section.

1.2 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.

1.3 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
- C. 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.

1.4 FIELD ENGINEERING

- A. Employ Land Surveyor registered in State of California and acceptable to Architect/Engineer.
- B. Locate and protect survey control and reference points. Promptly notify Architect/Engineer of discrepancies discovered.
- C. Control datum for survey is that established by Owner provided survey.
- D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- E. Submit copy of site drawing and certificate signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- F. Maintain complete and accurate log of control and survey work as Work progresses.
- G. On completion of site improvements, prepare certified survey illustrating dimensions, and elevations of site work.
- H. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- I. Promptly report to Architect/Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.

- J. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

1.5 PRECONSTRUCTION MEETING

- A. Construction Manager will schedule meeting after Notice of Award.
- B. Attendance Required: Owner, Architect/Engineer, Project Inspector, Construction Manager and Contractor(s).
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing parties in Contract, and Architect/Engineer.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling (General).
 - 8. Scheduling activities of Inspector and Geotechnical Engineer.
 - 9. Other items as needed.

1.6 SITE MOBILIZATION MEETING

- A. Construction Manager will schedule meeting at Project site prior to Contractor occupancy.
- B. Attendance Required: Owner, Construction Manager, Architect/Engineer, Special Consultants, and Contractor, Contractor's Superintendent, and major Subcontractors.
- C. Agenda:
 - 1. Use of premises by Owner and Contractor.
 - 2. Owner's requirements.
 - 3. Construction facilities and controls provided by Owner.
 - 4. Temporary utilities provided by Owner.
 - 5. Survey and utilities 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.
 - 13. Other items as needed

1.7 CONSTRUCTION PROGRESS MEETINGS

- A. Attend weekly meetings throughout progress of the Work
- B. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.

3. Field observations, problems, and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
 1. Fit the several parts together, to integrate with other Work.
 2. Uncover Work to install or correct ill-timed Work.
 3. Remove and replace defective and non-conforming Work.
- C. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

3.2 SPECIAL PROCEDURES

- A. Materials: As specified in product sections; match existing with new products for patching and extending work.
- B. Employ skilled and experienced installer to perform alteration work.
- C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- D. Remove unsuitable material.
- E. Remove debris and abandoned items from site.

END OF SECTION 013000

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General Project coordination procedures.
2. Coordination Drawings.
3. Project meetings.

B. See Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 GENERAL COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for District and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.

3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

1.3 PROJECT MEETINGS

A. General: Schedule and conduct weekly foreman meetings and other meetings throughout duration of construction. All meetings shall be held at the project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Construction Manager, District and Architect, within Five (5) days of the meeting.

B. Preconstruction Conference: Construction Manager will coordinate a preconstruction conference at the site or other convenient location prior to start of construction, at a time convenient to District and Architect, but no later than fifteen (15) days after execution of the Agreement. Contractor to attend meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of District, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

- a. Tentative construction schedule.
- b. Critical work sequencing.
- c. Designation of responsible personnel.
- d. Procedures for processing field decisions and Change Orders.
- e. Procedures for processing Applications for Payment.
- f. Distribution of the Contract Documents.
- g. Submittal procedures.

- h. Preparation of Record Documents.
 - i. Use of the premises.
 - j. Responsibility for temporary facilities and controls.
 - k. Parking availability.
 - l. Office, work, and storage areas.
 - m. Equipment deliveries and priorities.
 - n. First aid.
 - o. Security.
 - p. Progress cleaning.
 - q. Working hours.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction activities.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including but not limited to the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.

- k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Participate in all progress meetings held by Construction Manager at weekly and or other as needed intervals.
1. Attendees: In addition to representatives of District and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
- a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
- b. Review present and future needs of each entity present, including the following:
- 1) Interface requirements.

- 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Documentation of information for payment requests.
3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
4. Foreman and Subcontractor trade coordination meetings: Conduct weekly foreman and subcontractor trade meetings throughout the construction duration and as additionally required to coordinate all scheduled work/tasks needed to facilitate safety, flow of work and any other coordination required to complete the work of the project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Submittals
 - 2. Contractor's Construction Schedule
 - 3. Look Ahead Schedules
 - 4. Recovery Schedule
- B. Schedule Acceptance: Review comments made by the District or Construction Manager on the Contractor's schedule(s) will not relieve the contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for scheduling, sequencing and prosecuting the Work to comply with the requirements of the Contract Documents. Acceptance of a schedule.
- C. All costs associated with meeting the requirements of this section shall be included in the Contract amount.

1.2 DEFINITIONS

- A. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- B. Float: The time between earliest finish date and the latest finish date of each activity shown on the Construction Schedule.
- C. Fagnets: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- D. Major Area: A story of construction, a separate building, or a similar significant construction element.

1.3 SUBMITTALS

- A. Format:
 - 1. Submit one electronic file in native document format and one printed copy in PDF format for all types of schedules and reports.
- B. Milestones Schedule
- C. Contractor's Construction Schedule

- D. Monthly, 3 Week Look Ahead and Recovery schedules
- E. CPM Reports: Concurrent with CPM schedule, submit an electronic copy of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.

1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Within ten (10) days after the effective date of the Contract, Contractor shall develop and submit a proposed Construction Schedule for review by the District, Construction Manager and Architect. Contractor shall update and revise the proposed Construction Schedule as requested and submit until it is accepted. Contractor shall obtain acceptance of the initial Construction Schedule within thirty (30) days from commencement of the Contract time.
- B. When the initial Construction Schedule is accepted by the District and Construction Manager, it will be considered the 'Baseline Construction Schedule'. The Baseline Construction Schedule shall be the schedule against which all subsequent schedule updates shall be made; against which Contractor shall report progress to and/or variances from, and by which project progress shall be measured.
- C. Submittal of the Baseline Construction Schedule and subsequent schedule updates will be understood to be the Contractor's certification that the submitted schedule meets all of the

requirements of the Contract Documents, represents the Contractor's plan on how the work will be accomplished and accurately reflects the work that has accomplished and how it was sequenced (as-built logic).

- D. Time Frame: Extend schedule from date established for commencement of the Work to the date of final completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
 2. Contractor shall allocate a total of fifteen (15) work days within the overall duration of the Construction Schedule to account for adverse rain or weather days. A rain or adverse weather day is defined as days when work on critical path items is prevented for 50% or more of the scheduled work day. Any rain or adverse weather days must be identified in the daily reports, Look Ahead Schedules and monthly Construction Schedule Updates. These use of these days shall be mutually agreed upon during a monthly schedule review between the Contractor and the District or Construction Manager.
- E. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than twenty (20) days
 2. Procurement Activities: Include procurement activities for long lead items and major items, requiring more than 30 calendar days, as separate activities in the schedule. Procurement activities shall include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Construction Activities: Construction activities shall include time required for ancillary tasks required for a complete installation including but not limited to: Tasks related to mobilization or demobilization; pre-installation meetings, layout and pre-measurement activities, the installation of temporary or permanent work by tradesman; inspection of installed work by the Inspector of Record or other governing inspectors; laboratories or architect/engineers; and start up/testing of equipment or systems.
 4. Submittal Review Time: Include submittal review and re-submittal times indicated in Division 1 in schedule for all mockups and items with 15 or more working days of lead time. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 5. Deferred Submittals: Include a minimum of 20 working days for DSA review of deferred submittals. Include the original submittal and not less than two (2) re-submittals.
 6. Startup and Testing Time: Include not less than ten (10) total work days for startup and testing. Allocate startup and testing time separately for each major system or piece of equipment.
 7. Commissioning: Include activities for all commissioning tasks, LEED requirements that have time impact, building flush-out and HVAC startup/functional testing.
 8. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- F. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work by District: Include a separate activity for each portion of the Work performed by District (if applicable)
2. Work Restrictions: Show the effect on the schedule of the following (if applicable):
 - a. Coordination with existing construction or District activities
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Use of premises restrictions.
 - e. Provisions for future construction.
 - f. Seasonal variations.
 - g. Environmental control.
3. Work Stages: Indicate important stages of construction for each major portion of the Work.

- G. Float: A Schedule showing work completing in less time than the Contract time will be considered to have Project Float. Project Float is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date. If the construction progress is ahead of schedule based on the Construction Schedule and a delay is encountered (even if such delay is a District caused delay), no compensation of any type will be due the Contractor and the District may claim float days equal to the delay until such float days are exhausted and the delay extends the overall project substantial completion date.
- H. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, interim milestones indicated below, Substantial Completion, and Final Completion.
- I. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
1. Submittal of the Construction Schedule. The Contractor shall prepare and submit to the District, the Construction Manager and the Architect a Construction Schedule indicating, in graphic form, the estimated rate of progress and sequence of all Work required under the Contract Documents. Submit each Schedule in both printed form and electronic form which allows the review of logic and schedule calculations of the project schedule. The purpose of the Construction Schedule is to assure adequate planning and execution of the Work so that it is completed within the Contract Time and to permit evaluation of the progress of the Work. The Construction Schedules shall (i) be prepared utilizing Primavera P6; (ii) indicate the date(s) for commencement and completion of various portions of the Work including without limitation, procurement, fabrication and delivery of major items, materials or equipment; (iii) indicate manpower and other resources required

for completion of each Construction Schedule activity; (iv) identify major Submittals required by the Contract Documents, the date for the Contractor's submission of each Submittal and the date for the return of the reviewed Submittal to the Contractor and the time for fabrication and delivery. (v) contain a level of detail in which no single construction activity shall have a duration of 20 work days or longer.

- B. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE UPDATES

- A. Construction Schedule Updates: At monthly intervals, update the current Construction Schedule schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress payment request.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Concurrent with making revisions to schedule, prepare a written report (including software generated logs) indicating changes made between the previous and current versions of the schedule. Reports should include the following:
1. Identification of activities that have changed.
 2. Added and deleted activities or resources
 3. Changes in early and late start dates.
 4. Changes in early and late finish dates.
 5. Changes in activity durations in workdays.
 6. Changes in the critical path
 7. Description of activities along the 2 most critical paths
 8. Description of current and anticipated problems areas or delaying factors

9. Description of corrective actions anticipated for any delayed critical path items
10. Changes in total float or slack time.
11. Changes in the Contract Time.

- C. Distribution: Distribute copies of approved schedule to Construction Manager, Architect, District, separate Subcontractors and suppliers, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

3.2 3 WEEK LOOK AHEAD SCHEDULE

- A. To provide a more detailed level of planning for construction work in progress, the Contractor shall conduct ongoing reviews of scheduled activities, compare to the Baseline and/or the most current updated Construction Schedule and subsequently issue a Look Ahead Schedule on a weekly basis. This Look Ahead Schedule shall coordinate with and supplement the project Construction Schedule. In conjunction with the receipt of the Look Ahead Schedule, coordination meeting(s) will be held each week to discuss the Look Ahead Schedule. The Look Ahead Schedule shall be keyed to the activity numbers from the Construction Schedule and shall show the project activities that occurred the previous week and all activities that will occur during the current and following three-week interval. Critical path activities are to be identified on the Look Ahead Schedule. The Look Ahead Schedule shall be bar chart type schedule in sufficient detail to define the work to be accomplished, Subcontractor information and crew size and large tools or equipment. Open RFI's, submittals or testing/inspections for all critical path items shall be indicated on the Look Ahead Schedule for discussion during the weekly coordination meeting(s). Materials and Procurement items for each activity on the Look Ahead Schedule must be indicated along with associated delivery date(s) necessary for completion of directly and indirectly related work. A variance report indicating all activities in excess of 5 days behind schedule and proposed mitigation measures for each items shall be provided to supplement the Look Ahead Schedule.

3.3 RECOVERY SCHEDULE

- A. The Recovery Schedule shall be provided by the Contractor to recover lost time due to delays with the progress of the Contractor's Work, ability to meet Milestones or Critical Path activities and/or meet Project completion dates. Upon request of the District or Construction Manager, the Contractor shall provide an updated Recovery Schedule within 48 hours that indicates a plan to recover lost time and/or achieve the Milestone dates and sequencing of activities established in the most recent updated Construction Schedule. Any revisions must be approved by the District and Construction Manager. All Recovery Schedules shall be accompanied by a narrative statement including a description of current and anticipated problem areas of the Work, delaying factors and their impact and an explanation of corrective action taken or proposed by the Contractor.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 1 Specification Sections, apply to this Section. Refer to Divisions 2 through 33 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's and Construction Manager's responsive action.
- B. Informational Submittals: Written information that does not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. See Evaluations for cautions on use of electronic drawings, in first paragraph below, for submittals.
 - 1. Contractor use of Architect's project software files (ie. Revit or CAD) for generating shop drawings or submittals is at the discretion of the Architect and should not be considered as an added cost if not provided. If such use is granted by the Architect, waivers or conditions of use required by the Architect must be agreed to prior to release of any electronic files.
- B. All submittals shall be uploaded/entered and electronic PDF file attached in Procore Construction Software in addition to any hardcopy requirements
- C. All submittals/shop drawings/samples to be submitted within 4 weeks of General Contractor 'Notice of Contract Award' for general submittals and 6 weeks after General Contractor 'Notice of Contract Award' for shop drawings and deferred approval drawings. If an activity occurs early on the project schedule to warrant an earlier submittal deadline, than such item shall be submitted early enough to prevent any delay to scheduled construction activities.

- D. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- E. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Construction Manager, before being returned to Contractor.
- F. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.

- h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- G. Deviations: Encircle, cloud, or otherwise specifically identify deviations from the Contract Documents on submittals.
- H. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
- 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and Construction Manager.
 - 2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
- 1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number, numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
 - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on

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

- J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked "no exceptions taken" or similar indication that no further resubmittal action or corrections are required.
 - 4. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

- K. LEED Submittals shall also be submitted in accordance with Division 1 section 018113 – Sustainable Design Requirements. All LEED submittals shall appear on the Submittal Schedule. All LEED submittals shall be identified as separate from and in addition to other submittals. If a submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements. LEED submittals should contain only the data that backs up the LEED qualifications. The Material Content Form and the IAQ Verification Forms shall be used as the cover sheets for the LEED portions of the submittals

- L. Use for Construction: Use only final submittals with mark by Architect indicating "no exceptions taken" or similar indication that no further resubmittal action or corrections are required.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals as required

- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.

- d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
4. Submit Product Data before or concurrent with Samples.
 5. Number of Copies: Submit one (1) electronic and four (4) hardcopies of Product Data plus any additional copies required to be returned by Contractor, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

3. Number of Copies: Submit one (1) electronic copy and six (6) hardcopies of each submittal. Architect will return one copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit three (3) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned.

- 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
 4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect, through Construction Manager, will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.
- G. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."
- H. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."
- I. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."
- J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A (attached after this section) Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect and Construction Manager will not return copies.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Assurance."
- B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Schedule."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."
- N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."
- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product

or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- T. **Manufacturer's Field Reports:** Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- U. **Insurance Certificates and Bonds:** Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- V. **Material Safety Data Sheets (MSDSs):** Submit information directly to Owner; do not submit to Architect.
1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.3 DELEGATED DESIGN

- A. **Performance and Design Criteria:** Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. **Delegated-Design Submittal:** In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design

professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered non responsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 013300

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standard in effect as of date of Advertisement for Bids, unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
- D. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard of publication. Where acronyms or abbreviations are used in the Specifications or other Contract Documents they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations," or Columbia Books' "National Trade & Professional Association of the U.S.", which are available in most libraries.

1.3 REGULATORY REQUIREMENTS

- A. The Work shall be performed in accordance with applicable code requirements of applicable regulatory agencies, including, but not limited to, the following:
 - 1. Federal and State Occupational Safety and Health Administrations.
 - 2. State of California Code of Regulations, including Titles 8, 17, 19, 23, 24, 25 and 26.
 - 3. California Building Code, 2013 Edition.
 - 4. California Mechanical Code, 2013 Edition.
 - 5. California Plumbing Code, 2013 Edition.
 - 6. California Electrical Code, 2013 Edition.
 - 7. California Fire Code, 2013 Edition.
 - 8. California Referenced Standards Code, 2013 Edition, Part 12, Title 24.
 - 9. Federal Americans with Disabilities Act, Title III.

10. U.S. Environmental Protection Agency.
11. National Fire Protection Association, NFPA 13, 14, 17A, 24, 72, 253, 2007 and other applicable titles as referenced in CBC Chapter 35.
12. County Air Pollution Control District and County Health Department, CBC Chapter 47.

1.4 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Approved: The term "approved", where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the responsibilities and duties of the Architect as stated in the Conditions of the Contract.
- C. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.
- D. Regulations: The term "regulations" includes laws, statutes, ordinances, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the Work.
- E. Furnish: The term "furnish" means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- F. Install: The term "install" describes operations at Project site including the actual unloading, unpacking, temporary storage, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.
- G. Provide: The term "provide" means to furnish and install, complete and ready for the intended use.
- H. Installer: An installer is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor or contractor of lower tier for performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 1. Unless indicated otherwise, the term "experienced", when used with the term "installer", means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
 2. Trades: Use of terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter". It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

- I. "Project site" is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other construction activities as part of the Project. The extent of the Project site is shown on the Drawings.
- J. Owner's Representative: Where the term "Owner's Representative" is used, it shall also mean the Architect.
- K. The terms District and Owner shall be synonymous.
- L. District or Owner shall also mean the Antelope Valley College Community College District.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION_(Not Applicable)

END OF SECTION 014200

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SECTION 014300 - QUALITY ASSURANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Division 0 Specification Sections, Division 1 Specification Sections apply to this section.

1.2 RELATED SECTIONS

- A. Section 014523 – Testing and Inspection.
- B. Section 014339 – Mock-up Requirements.

1.3 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances
- C. References.
- D. Testing and inspection services.
- E. Manufacturers' field services.
- F. Examination.
- G. Preparation.

1.4 QUALITY CONTROL AND 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. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer 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. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.5 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. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.6 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.
- F. Refer to Section 01 42 00 "References" for additional requirements.

1.7 TESTING AND INSPECTION SERVICES

- A. Owner will employ and pay for specified services of an independent firm to perform testing and inspection.
- B. Owner will employ Construction Phase – Geotechnical Engineer to inspect sitework and foundations.
- C. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by Architect/Engineer.
 - 1. Laboratory: Authorized to operate in State of California.
 - 2. Laboratory Staff: Maintain full time registered Engineer on staff to review services.

3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.
- D. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Architect/Engineer or Owner.
- E. Reports will be submitted by independent firm to Architect/Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- F. Cooperate with independent firm; furnish samples of materials, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 1. Notify Architect/Engineer and independent firm 24 hours prior to expected time for operations requiring services.
 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- G. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- H. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Architect/Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- I. Agency Responsibilities:
 1. Test samples of mixes submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
 3. Contractor in performance of services.
 4. Perform specified sampling and testing of products in accordance with specified standards.
 5. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 6. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 7. Perform additional tests required by Architect/Engineer.
 8. Attend preconstruction meetings and progress meetings.

- J. Agency Reports: After each test, promptly submit two copies of report to Architect/Engineer and to Contractor. When requested by Architect/Engineer, provide interpretation of test results. Include the following:
1. Date issued.
 2. Project title and number.
 3. Name of inspector.
 4. Date and time of sampling or inspection.
 5. Identification of product and specifications section.
 6. Location in Project.
 7. Type of inspection or test.
 8. Date of test.
 9. Results of tests.
 10. Conformance with Contract Documents.
- K. Limits On Testing Authority:
1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency or laboratory may not approve or accept any portion of the Work.
 3. Agency or laboratory may not assume duties of Contractor.
 4. Agency or laboratory has no authority to stop the Work.

1.8 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, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect/Engineer 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.
- D. Refer to Section 01 33 00 - SUBMITTAL PROCEDURES.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify 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.

3.2 PREPARATION

- A. Clean substrate surfaces prior to attaching next material.

END OF SECTION 014300

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

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

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use

as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices, General: A mobile field office will be acceptable.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

2.3 TEMPORARY TREE PROTECTION

- A. Provide temporary fence protection at the drip-line around each tree within the construction area. Maintain area within protection area free of debris, construction items and foreign material. Irrigate trees to maintain health throughout construction period. Remove fencing and rake clean area at conclusion of construction. Replace any trees lost with like size and species.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 500 ft. of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touchup signs so they are legible at all times.
- F. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 011000 "Summary."
 - 2. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - 3. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

- D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- F. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

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

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

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SECTION 015719 – INDOOR AIR QUALITY (IAQ) MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Special requirements for Indoor Air Quality (IAQ) management during construction operations.
 - a. Control of emissions during construction.
 - b. Moisture control during construction.
2. Procedures for testing baseline IAQ. Baseline IAQ requirements specify maximum indoor pollutant concentrations for acceptance of the facility.

B. Related Sections:

1. Division 01 Section "Quality Assurance" for meetings and project coordination.
2. Division 01 Section "Closeout Procedures" for final cleaning and submittals.
3. Division 01 Section "General Commissioning Requirements".

1.3 DEFINITIONS

- A. Definitions pertaining to sustainable development: As defined in ASTM E2114.
- 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 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 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.

1.4 PRECONSTRUCTION MEETING

- A. After award of Contract and prior to the commencement of the Work, schedule and conduct a meeting with Owner and Architect to discuss the proposed IAQ Management Plan and to develop mutual understanding relative to details of environmental protection.

1.5 SUBMITTALS

A. Product Data:

1. Submit product data for filtration media used during construction and during operation. Include Minimum Efficiency Reporting Value (MERV).
2. Material Safety Data Sheets: Submit MSDSs for inclusion in Operation and Maintenance Manual for the following products. Coordinate with Section 017823.
 - 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
3. Submit product certifications for all composite wood and agrifiber products confirming they contain no added urea-formaldehyde resins.

PART 2 - PRODUCTS

2.1 ADHESIVES AND SEALANTS

- A. All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) must comply with the following limits for VOC content when calculated according to 40 CFR 50, Subpart D (EPA method 24):
1. Wood Glues: 30 g/L
 2. Millwork and Casework Adhesives: 20 g/L
 3. Casework Sealant: 50 g/L
 4. Metal to Metal Adhesives: 30 g/L
 5. Adhesives for Porous Materials (Except Wood): 50 g/L
 6. Subfloor Adhesives: 50 g/L
 7. Plastic Foam Adhesives: 50 g/L
 8. Carpet Adhesives: 50g/L
 9. Carpet Pad Adhesives: 50 g/L
 10. Carpet Seam Sealer: 50 g/L
 11. VCT and Sheet Vinyl Adhesives: 50 g/L
 12. Cove Base Adhesives: 50 g/L
 13. Rubber Floor Adhesives: 60 g/L
 14. Wood Floor Adhesives: 100 g/L
 15. Ceramic Tile Adhesives: 65 g/L
 16. Gypsum Board and Panel Adhesives: 50 g/L
 17. Multipurpose Construction Adhesives: 70 g/L
 18. General Contact Adhesive: 80 g/L
 19. Special Purpose Contact Adhesive: 250 g/L
 20. Structural Glazing Adhesives and Compounds: 100 g/L
 21. Structural Wood Member Adhesive: 140 g/L
 22. Top & Trim Adhesive: 250 g/L
 23. Silicone Sealant: 50 g/L
 24. Pipe Thread Sealant: 50 g/L
 25. Plastic Cement Welding Compounds: 250 g/L
 26. ABS Welding Compounds: 325 g/L
 27. CPVC Welding Compounds: 490 g/L
 28. PVC Welding Compounds: 510 g/L
 29. Adhesive Primer for Plastic: 250 g/L
 30. Architectural Non-Porous Sealants and Sealant Primers: 250 g/L
 31. Architectural Porous Sealants and Sealant Primers: 775 g/L
 32. Single-Ply Roofing Membrane Adhesives: 250 g/L
 33. General Purpose Mist Spray Aerosol Adhesives: 65% VOCs by weight.
 34. General Purpose Web Spray Aerosol Adhesives: 55% VOCs by weight.
 35. Special Purpose Aerosol Adhesives (all types): 70% VOCs by weight
- B. Interior sealants shall not contain: mercury, butyl rubber, neoprene, SBT (styrene butadi-ene rubber), or nitrile.

- C. Sealants and glazing compounds formulated with aromatic solvents (organic solvent with a benzene ring in its molecular structure) fibrous talc or asbestos, formaldehyde, halo-genated solvents, mercury, lead, cadmium, hexavalent chromium, or their components shall not be used.
- D. Adhesives used to apply laminates, whether shop-applied or field-applied, shall contain no urea-formaldehyde.

2.2 PAINTS AND COATINGS

- A. Interior Paints and Coatings: For interior field-applied applications, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the chemical restrictions (Restricted Components listed below) of Green Seal Standard GS-11, Paints, First Edition, May 20, 1993; Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997; and South Coast Air Quality Management District Rule 1113, Architectural Coatings, rules in effect on January 1, 2004, as follows:
 - 1. Primers, Sealers, Undercoaters: Not more than 100 g/L of VOC per liter of coating less water and exempt compounds, including pigments.
 - 2. Flat Paints and Coatings: Not more than 50 grams of VOC per liter of coating less water and exempt compounds, including pigments.
 - 3. Non-Flat Paints and Coatings: Not more than 100 grams of VOC per liter of coating less water and exempt compounds, including pigments.
 - 4. High Gloss Paints and Coatings: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments. High Gloss Coatings are coatings that register a gloss of 70 or above on a 60-degree meter according to ASTM Test Method D 523 as specified in paragraph (e)(6).
 - 5. Water-Based Polychromatic Finish Coatings: Not more than 150 g/L (150 g/L for primer and flat polychromatic paint).
 - 6. Anti-Corrosive Coatings: Not more than 250 grams of VOC per liter of coating less water and exempt compounds.
 - 7. Sanding Sealers: Not more than 50 grams of VOC per liter of coating less water and exempt compounds.
 - 8. Waterproofing Sealers: Not more than 250 grams of VOC per liter of coating less water and exempt compounds.
 - 9. Concrete Slab Sealers: Not more than 400 grams of VOC per liter of coating less water and exempt compounds.
 - 10. Polyurethanes: Not more than 100 grams of VOC per liter of coating less water and exempt compounds.
 - 11. Stains: Not more than 250 grams of VOC per liter of coating less water and exempt compounds.
 - 12. Interior paints shall not contain antimicrobial additives (such as fungicides and biocides).
 - 13. Aromatic Compounds: Paints and coatings shall not contain more than 1% (by weight) total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - 14. Restricted Components: Paints and coatings shall not contain any of the following:

- a. Acrolein
- b. Acrylonitrile
- c. Aniline dyes
- d. Antimony
- e. Benzene
- f. Butyl benzyl phthalate
- g. Cadmium
- h. Di (2-ethylhexyl) phthalate
- i. Di-n-butyl phthalate
- j. Di-n-octyl phthalate
- k. 1,2-dichlorobenzene
- l. Diethyl phthalate
- m. Dimethyl phthalate
- n. Ethylbenzene
- o. Formaldehyde
- p. Hexavalent chromium
- q. Isophorone
- r. Lead
- s. Mercury
- t. Methyl ethyl ketone
- u. Methyl isobutyl ketone
- v. Methylene chloride
- w. Naphthalene
- x. Toluene (methylbenzene)
- y. 1,1,1-trichloroethane
- z. Vinyl chloride
- aa. Xylene

2.3 COMPOSITE WOOD AND AGRIFIBER BINDERS

- A. All composite wood, agrifiber products, and wood doors shall contain no added urea-formaldehyde binder resins.

PART 3 - EXECUTION

3.1 IAQ MANAGEMENT – EMISSIONS CONTROL

- A. During construction operations, follow the recommendations in SMACNA IAQ Guidelines for Occupied Buildings under Construction.
- B. HVAC Protection:
 - 1. Seal return registers during construction operations.
 - 2. Provide temporary exhaust during construction operations.
 - 3. To the greatest extent possible, isolate and/or shut down the return side of the HVAC system during construction. When ventilation system must be operational during construction activities, provide temporary filters.

- a. Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 during construction. Replace filters prior to occupancy with those recommended in Mechanical Plans. Coordinate with work of Division 23 Heating Ventilating and Air Conditioning (HVAC).
- C. Source Control: Provide low and zero VOC materials as specified.
- D. Pathway Interruption: Isolate areas of work as necessary to prevent contamination of clean or occupied spaces. Provide pressure differentials and/or physical barriers to protect clean or occupied spaces.
- E. Housekeeping: During construction, maintain project and building products and systems to prevent contamination of building spaces.
- F. Scheduling: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.
- G. Provide adequate ventilation during and after installation of interior wet products and interior final finishes.

3.2 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 Architect/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 after each rain event.
 - a. Where stored on-site or installed absorptive materials become wet, notify Architect and Owner. Inspect for damage. If acceptable to Architect/Owner, dry completely prior to closing in assemblies; otherwise, remove and replace with new materials.
 - 4. Site drainage: Verify that final grades of site work and landscaping drain surface water and ground water away from the building.

5. Weather-proofing: Inspect moisture control materials as they are being installed. Include the following:
 - a. Air barrier: Verify air barrier is installed without punctures and/or other damage. Verify air barrier 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.
 6. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
 7. HVAC: Inspect HVAC system as specified in Section 019113 General Commissioning Requirements.
- 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 barriers, flashing, exterior sealants and roofing, at the earliest possible time.

END OF SECTION 015719

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Division 0 Specification Sections, Division 1 Specification Sections apply to this section.
- B. Division 2 through 33 Sections for specific requirements for warranties on products and installation specified to be warranted.

1.2 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.
- F. Special Warranties.

1.3 DEFINITIONS

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

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

- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even in previously selected products were also options.
- B. When a named manufacturer or product is specified, based upon a manufacturer's statements in advertising or product data that the product complies with applicable codes or standards, and the product does not, or is found not to, comply with applicable codes or standards, then a substitution shall be provided upon approval by the Architect without extra cost to Owner. The Owner and Architect may rely on manufacturer's advertising and product data.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products to allow for inspection and measurement of quantity or counting of units.
 6. Store materials in a manner that will not endanger Project structure.
 7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 9. Protect stored products from damage.
- B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment furnished by Owner's construction forces. Coordinate location with Owner.
- C. Requirements specified above also apply to existing items to be removed and reinstalled in Project.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: Form is included at end of this Section. Prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 2 through 32 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures".

PART 2 – PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finishes, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected", Architect will make selection.
5. Where products are accompanied by the term "match sample", sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures: Comply with the Conditions of the Contract and the following:

1. Basis-of-Design Products: Where Specification paragraphs or subparagraphs list a "Basis-of-Design Product(s)" and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product names. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
2. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "Substitutions" for selection of a matching product.
3. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, texture" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, texture" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

1. See Section 012500 Substitution Procedures

2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 – EXECUTION (Not Used)

WARRANTY FORM: See following page.

THIS SECTION CONTINUED ON FOLLOWING PAGE

Date: _____ Project Name: _____

WARRANTY FOR _____, in Agreement between _____
(Specification Section) (Owner)and _____
(the "Contractor") Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 016000

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SECTION 017300 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. General installation of products.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.
6. Correction of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

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

1. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify District not less than five working days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without District's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information (RFI) to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record 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. Make the log available for reference by Architect.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.

F. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

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

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

G. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

H. 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.

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

3.6 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Sections include the following:
 - 1. Division 01 "Selective Demolition for Remodeling"

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 95 percent by weight of total waste generated by the Work.

B. Salvage/Recycle Requirements: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible. Owner has established minimum goals for the following materials:

1. Site Asphalt Concrete and Portland Cement Concrete Waste: The Contractor shall recycle all demolished Asphalt Concrete and Portland Cement Concrete to ensure that none of the material will be disposed of at a landfill. Prior to starting work, the Contractor shall submit a plan to be approved by the architect that demonstrates that all Asphalt Concrete and Portland Cement Concrete generated from the project will be recycled. The contractor shall provide to the architect weigh tickets or other evidence that the material to be recycled has been disposed of at a recycling facility.
2. Other Demolition Waste:
 - a. Concrete.
 - b. Concrete reinforcing steel.
 - c. Concrete masonry units.
 - d. Wood studs.
 - e. Wood joists.
 - f. Plywood and oriented strand board.
 - g. Wood paneling.
 - h. Wood trim.
 - i. Structural and miscellaneous steel.
 - j. Rough hardware.
 - k. Roofing.
 - l. Insulation.
 - m. Doors and frames.
 - n. Door hardware.
 - o. Windows.
 - p. Glazing.
 - q. Metal studs.
 - r. Gypsum board.
 - s. Acoustical tile and panels.
 - t. Carpet.
 - u. Carpet pad.
 - v. Demountable partitions.
 - w. Equipment.
 - x. Cabinets.
 - y. Plumbing fixtures.
 - z. Piping.
 - aa. Supports and hangers.
 - bb. Valves.
 - cc. Sprinklers.
 - dd. Mechanical equipment.
 - ee. Refrigerants.
 - ff. Electrical conduit.
 - gg. Copper wiring.

- hh. Lighting fixtures.
- ii. Lamps.
- jj. Ballasts.
- kk. Electrical devices.
- ll. Switchgear and panelboards.
- mm. Transformers.

3. Construction Waste:

- a. Site-clearing waste.
- b. Masonry and CMU.
- c. Lumber.
- d. Wood sheet materials.
- e. Wood trim.
- f. Metals.
- g. Roofing.
- h. Insulation.
- i. Carpet and pad.
- j. Gypsum board.
- k. Piping.
- l. Electrical conduit.
- m. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.5 SUBMITTALS

- A. Waste Management Plan: Submit 3 copies of plan for approval prior to commencement of demolition, within 10 days of date established for the Notice to Proceed.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit 3 copies of report. Include separate reports for demolition and construction waste. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.

7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit 3 copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.
- I. Statement of Refrigerant Recovery (if applicable): Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 1. Review and discuss waste management plan.
 2. Review requirements for documenting quantities of each type of waste and its disposition.
 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
 - 1. Total quantity of waste.
 - 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 - 3. Total cost of disposal (with no waste management).
 - 4. Revenue from salvaged materials.
 - 5. Revenue from recycled materials.
 - 6. Savings in hauling and tipping fees by donating materials.
 - 7. Savings in hauling and tipping fees that are avoided.
 - 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 - 9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Architect and Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned within 3 days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: To be removed from Project site.

C. Salvaged Items for Owner's Use:

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. Doors and Hardware for Salvaging: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Doors for reuse: Remove hardware and store for reuse.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:

1. Allan Company, Palmdale (661) 273-0775

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2-inch (38-mm) size.

1. Crush asphaltic concrete paving and screen to comply with requirements in Division 32 Exterior Improvements for use as general fill.

B. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.
 - 2. Crush concrete and screen to comply with requirements in Division 32 Exterior Improvements for use as satisfactory soil for fill or sub-base.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Pulverize masonry to maximum 1-inch (25-mm) size.
 - a. Crush masonry and screen to comply with requirements in Division 32 Exterior Improvements for use as satisfactory soil for fill or sub-base.
 - b. Crush masonry and screen to comply with requirements in Division 32 Exterior Improvements for use as mineral mulch.
 - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
 - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Manufacturer, Carpet Reclamation Agency or carpet recycler.
- K. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- L. Plumbing Fixtures: Separate by type and size.

- M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- N. Lighting Fixtures: Separate lamps by type and protect from breakage.
- O. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- P. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Burning waste materials is prohibited.
- C. Disposal: Transport waste materials not included in percentage of recycling materials listed above off Owner's property and legally dispose of them.

END OF SECTION 017419

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Contract closeout including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project Record Documents.
 - 3. Operation and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Initial cleaning (including linoleum flooring cleaning).
 - 6. Final cleaning.
 - 7. Instruction of Owner's personnel.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 32.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Completion, comply with requirements in the Conditions of the Contract and complete the following.
 - 1. Advise the Owner of pending insurance changeover requirements.
 - 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 4. Submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, required surveys, and similar final record information.
 - 5. Deliver tools, spare parts, extra stock, and similar items. Label with manufacturer's name and model number where applicable.
 - 6. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel.
 - 7. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
 - 8. Submit test/adjust/balance records.
 - 9. Complete final cleanup requirements, including touchup painting.
 - 10. Touch up and otherwise repair and restore marred, exposed finishes.

11. Complete building ventilation period, per Mechanical, using 100 percent fresh air and then readjust dampers.
12. Transmit permanent cores and lock keys to Owner if required. Advise Owner's personnel of changeover in security provisions.
13. Submit the final payment request with releases of claims and stop notices, and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
14. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
15. Submit consent of surety to final payment.
16. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
17. Submit a final liquidated damages settlement statement.

B. Inspection Procedures: The Architect will inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of inspection, if Work is Complete, the Architect will prepare a final Certificate of Payment. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, inspection will be repeated. If more than the two (2) inspections by Architect and Owner's Inspector are required, the Owner will charge the Contractor the cost of additional inspections.

1.4 PROJECT RECORD DOCUMENTS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.

1. Permanently and clearly mark each record document with an appropriate label identifying it as a record document.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.

2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
 3. Note related Change Order numbers and Construction Change Directive numbers where applicable.
 4. Dimension to underground and concealed utilities from permanent structural features.
 5. Deliver both the full sized hardcopy of red-lined Record Drawings and one color scanned PDF electronic file to Architect at time of Completion. Architect will give to Owner.
 - a. The above requirements are in addition to the requirements specified elsewhere in the Contract Documents.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
1. Mark these documents to show variations in actual Work performed in comparison with the text of the Specifications and modifications.
 2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
 3. Note related Record Drawing information and Product Data.
 4. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.
- D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of Record Drawings and Specifications.
1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
 2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
 3. Upon completion of markup, submit complete set of record Product Data to the Architect for the Owner's records.
- E. Record Sample Submitted: Immediately prior to Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples (if any) are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records

1.5 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Division One section 'Operation and Maintenance Data'

1.6 WARRANTIES

- A. **Disclaimers and Limitations:** Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- B. **Related Damages and Losses:** When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- C. **Reinstatement of Warranty:** When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- D. **Replacement Cost:** Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- E. **Owner's Recourse:** Expressed warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. **Rejection of Warranties:** The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
 - 2. **Warranties required in individual Specifications Sections** are in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
- F. Where the Contract Documents require a special warranty or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- G. Submit written warranties to the Architect prior to the date certified for final Completion. If the Architect's Certificate of Final Acceptance designates a commencement date for warranties other than the date of Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
- H. Forms for special warranties are included in Division 1 Section "Product Requirements". Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or the Contractor, Installer, supplier, or manufacturer. Submit a draft to the Owner through the Architect for approval prior to final execution.

1. Refer to Sections of Divisions-2 through -32 for specific content requirements and particular requirements for submittal of special warranties.
- I. Form of Submittal: At Completion compile two copies of each required warranty properly executed by the Contractor, or by the Contractor, Installer, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- J. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Completion is indicated.
- K. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES", Project name, and name of Contractor.
- L. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Provide instructors experienced in operation and maintenance procedures. All training sessions should be videotaped and the electronic file turned in to the District as part of Operations and Maintenance manuals
 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 3. Schedule training with Owner with at least seven days' advance notice.

4. Training shall be done just prior to completion of the project, not at time of product installation. Contractors shall not charge additional to provide an additional site visit if required for training at end of project.
 5. Coordinate instructors, including providing notification of dates, times, length of instruction and course of content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. Include instruction for the following:
1. System design and operational philosophy.
 2. Review of documentation.
 3. Operations.
 4. Adjustments.
 5. Troubleshooting.
 6. Maintenance.
 7. Repair.

3.2 LINOLEUM FLOORING INITIAL CLEANING

- A. Perform Manufacturer's Maintenance Recommendations and the following operations at the times recommended by flooring manufacturer.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Linoleum Flooring Initial Cleaning: Perform manufacturer's Maintenance Recommendations and the following operations at the times recommended by the flooring manufacturer.
 - a. Wait a minimum period of 5 days after flooring installation before conducting wet cleaning procedures to allow the adhesive the proper time to set.
 - b. Remove all surface soil, debris, sand and grit by sweeping, vacuuming or dust mopping.
 - c. Scrub the floor with a neutral pH detergent/cleaner, such as Johnson Diversey Stride.
 - 1.) Mix neutral pH cleaning solution according to the label directions. **IMPORTANT: The pH of the cleaner in solution must be between 6 – 8 pH.**
 - 2.) Apply the solution to the floor. Do NOT flood the floor. The solution can be applied with either a mop and bucket or an automatic scrubber.
 - d. Scrub the floor with a rotary scrubber or automatic scrubber using a 3M Red Buffer Pad #5100 or equivalent. NOTE: For heavier soil loads, a 3M TopLine Autoscrubber Pad #5000 or equivalent may be used.
 - e. If not using an automatic scrubber, pick up the scrubbing solution with a wet vacuum (preferred) or a squeegee and a mop.

- f. Rinse the entire floor surface with clean mop using clean, cool water. Pick up rinse water with wet vacuum or automatic scrubber.
 - g. Allow the floor to dry thoroughly before allowing traffic.
- C. Protect resilient products against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.
- 1. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Completion.

3.3 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with applicable laws and ordinances and environmental and anti-pollution regulations.
- B. Cleaning: Professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- 1. Complete the following cleaning operations before requesting inspection for final Completion for each portion of Project or for entire Project:
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass.
 - c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures, lamps, and reflectors.
 - e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.
 - f. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace ones that cannot be satisfactorily repaired or restored.
 - g. Replace disposable air filters and clean permanent filters. Clean exposed surfaces of diffusers, registers, and grills.
 - h. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
 - i. Clean ducts, blowers, and coils.
 - j. Leave Project clean and ready for occupancy.

B. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Store these materials as directed by the Owner.

PART 3 – SUBMITTALS

4.1 SUBMITTAL REQUIREMENTS AND SCHEDULE

A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1 Section "Product Requirements" for substitution requests.

Contractor's Initials Contractor is to acknowledge with initials each Submittal included. Attach a letter of explanation for each submittal not included.

_____ All submitted products are as specified.

B. Submittal Schedule:

- _____ 1. Warranties.
- _____ 2. Workmanship bonds, if any.
- _____ 3. Maintenance service agreements, if any.
- _____ 4. Occupancy permits.
- _____ 5. Record Drawings, Specifications, Product Data, Samples, and miscellaneous records.
- _____ 6. Operation and Maintenance Manuals.
- _____ 7. Location and elevation survey.
- _____ 8. Tools, spare parts, and extra stock.
- _____ 9. Test/adjust/balance records.
- _____ 10. Consent of surety to final payment.
- _____ 11. Evidence of continuing insurance coverages if required.
- _____ 12. Final releases of claims and stop notices.
- _____ 13. Final payment request.
- _____ 14. Certified copy of Architect's final inspection list of items to be completed indicating completion.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Emergency manuals.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

B. Related Sections: All sections included for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 SUBMITTALS

A. Manual: Submit one (1) electronic file in PDF format and four (4) color copies of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.

5. Name, address, and telephone number of Contractor.
 6. Name and address of Architect.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic electronic media for computerized electronic equipment.
 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, flood, gas leak, water leak, power failure, water outage, equipment failure, and chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:

D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, and demonstration and training videotape if available, that detail essential maintenance procedures:

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - b. Final Submittal:
 - 1) Submit three] paper-copy set(s) of marked-up record prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
- B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.
 - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing District's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For facilitator.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name of Architect.
 - c. Name of Contractor.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manual(s) for District's use [prepared and bound in format matching operation and maintenance manuals]

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
 1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with District's operations. Adjust schedule as required to minimize disrupting District's operations and to ensure availability of District's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each

module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: 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. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.

5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include 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. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and District for number of participants, instruction times, and location.

- B. Engage qualified instructors to instruct District's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. District will furnish an instructor to describe District's operational philosophy.
 - 3. District will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with District, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and give to District. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

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SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for use of premises, and Owner-occupancy requirements.
 - 2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 3. Division 01 Section "Execution Requirements" for cutting and patching procedures.
 - 4. Division 01 Section "Construction Waste Management and Disposal" for disposal of demolished materials.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Qualification Data: For demolition firm.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other tenants affected by selective demolition operations.

5. Coordination of Owner's continuing occupancy of portions of adjacent building.
6. Means of protection for items to remain and items in path of waste removal from building.

C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program. Requirements for Building Reuse:

1. Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
2. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

1.6 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items:

- a. Furniture; Computers; Miscellaneous non-building items.

B. Notify Owner and Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials:

1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

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.

1.7 WARRANTY

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey 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 demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and videotapes.
 - 1. Comply with requirements specified in Division 01 Section "Photographic Documentation."
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

2. Arrange to shut off indicated utilities with utility companies.
 3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.
- C. Abandoned facilities shall not remain in place within building and pavement areas. Building area is defined as that area within, and extending a minimum of 5 feet outside of, the perimeter of the building and the perimeter of steps, landings, patios, walkways and the like which are contiguous with the building. Pavement area is defined as that area within, and extending a minimum of 3 feet outside of, the limits of asphalt or concrete pavement and the limits of curb, gutter, and sidewalk contiguous with the pavement.

3.3 DISPOSAL

- A. Remove from the work area, transport to a suitable location, and legally dispose of all unsuitable soil materials, rubbish, and debris resulting from clearing, demolition, and grading operations.
- B. Burning is not permitted.

3.4 DUST CONTROL

- A. Employ all labor, equipment and methods required to prevent construction operations from producing dust in amounts damaging to persons, property, vegetation and animals or causing a nuisance to persons occupying buildings in the vicinity of the job site. Continue dust abatement measures until relief is granted by the Owner's Representative.

Contractor shall be responsible for any damage caused by dust resulting from his operations.

3.5 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.6 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

- B. Owner's Environmental Goal for Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
 - 1. Inventory and 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.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by 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.

3.7 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- E. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them per Section 017419.

3.9 CLEANING

A. 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 024119

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Slabs-on-grade.
- B. Related Sections include the following:
 - 1. Division 32 Section "Concrete Paving" for exterior concrete pavement and walks, including curbs and gutters.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.
 - 1. reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments. Design mixtures shall be prepared by and signed and sealed by a Registered Civil Engineer.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

E. Samples: For vapor retarder.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

- 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

C. Material Certificates: For each of the following, signed by manufacturers:

- 1. Cementitious materials.
- 2. Admixtures.
- 3. Form materials and form-release agents.
- 4. Steel reinforcement and accessories.
- 5. Granular fill.
- 6. Curing compounds.
- 7. Floor and slab treatments.
- 8. Bonding agents.
- 9. Adhesives.
- 10. Semi-rigid joint filler.
- 11. Joint-filler strips.
- 12. Repair materials.

D. Field Quality-Control Test and Inspection Reports: By Inspector of Record (IOR) and Testing Agency.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. 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.

- 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

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 Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. 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.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints. Refer to Section 033300 for form facing materials for colored architectural concrete.
 - 1. Plywood, metal, or other approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

- D. Plain-Steel Wire: ASTM A 82, as drawn.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type II, gray Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. Use ASTM C227 to determine alkali reactivity of the aggregates as specified therein. The alkali reactivity shall be "innocuous" as determined by ASTM C289.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- D. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.

- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Color Pigment: Refer to Division 03 Section "Colored Architectural Concrete."

2.7 GRANULAR FILL

- A. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, with 90 to 100 percent passing a $\frac{3}{4}$ sieve; 0 to 10 percent passing a No. 4 sieve; and 0 to 3 percent passing a No. 100 sieve.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a $\frac{3}{8}$ -inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.8 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet. USE FOR ALL FLATWORK, SLABS AND TOPPING.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
1. Products:
 - a. Anti-Hydro International, Inc.; AH Clear Cure WB.
 - b. Burke by Edoco; Spartan Cote WB II.
 - c. ChemMasters; Safe-Cure & Seal 20.
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
 - e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
 - f. Euclid Chemical Company (The); Aqua Cure VOX.
 - g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.

- h. Lambert Corporation; Glazecote Sealer-20.
- i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
- j. Meadows, W. R., Inc.; Vocomp-20.
- k. Metalcrete Industries; Metcure.
- l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
- m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
- n. Tamms Industries, Inc.; Clearseal WB 150.
- o. Unitex; Hydro Seal.
- p. US Mix Products Company; US Spec Hydrasheen 15 percent

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Reglets: Fabricate reglets of not less than 0.0217-inch thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4500 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 4500 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 15 percent.
 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 5. Silica Fume: 10 percent.
 6. Combined Fly Ash, Pozzolans, and Silica Fume: 15 percent with fly ash or pozzolans not exceeding 15 percent and silica fume not exceeding 10 percent.
 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup. See Division 03 Section "Architectural Concrete" for other details.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: As indicated on the Drawings.

2. Maximum Water-Cementitious Materials Ratio: 0.55.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 4½ percent, plus or minus 1.5 percent at point of delivery.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on the Drawings.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Minimum Cementitious Materials Content: 610 lb/cu. yd.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: 4½ percent, plus or minus 1.5 percent at point of delivery.
6. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd, increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 48 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.
 1. Place and compact a 1/2-inch thick layer of fine-graded granular material over granular fill.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls practical. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting

action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent

- surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

- c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 - d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom. Coordinate finish with Section 093000 "Tiling".
- 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
- 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Concrete Curing: Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Use only this method for slabs, concrete fill and toppings. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions. Refer to Section 033300 for other details.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than seven days old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a resident inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports per Division 01 Section "Testing and Inspections."

SECTION CONTINUES ON FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College –Child Development Shade Canopies

WARRANTY FOR _____, in Agreement between Antelope Valley Comm. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 033000

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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Steel framing, brackets and supports for audio-visual, mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Loose bearing and leveling plates for applications where they are not specified in other Sections.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Paint products.

- B. Shop Drawings: Show fabrication and installation details. Include plans and details of metal fabrications and their connections. Show anchorage and accessory items., elevations, sections, Provide Shop Drawings for the following:

1. Steel framing and supports for audio-visual, mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.

- C. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm) or as indicated.
2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B with G90 (Z275) coating; [0.108-inch (2.8-mm)] [0.079-inch (2-mm) nominal. Thickness.
3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B structural steel, Grade 33 (Grade 230); [0.0966-inch (2.5-mm)] minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or] chemical anchors.
 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
- E. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," Section 099123 Interior Painting," and Section 099600 "High-Performance Coatings."
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
1. Products: Subject to compliance with requirements, provide one of the following
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.6 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.7 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

- C. Shop prime iron and steel items not indicated to be galvanized] unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Section 099113 "Exterior Painting" and in Section 099123 "Interior Painting."
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." SSPC-SP 3, "Power Tool Cleaning." [requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions and overhead doors securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- E. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting." And Section 099123 "Interior Painting."
- F. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

SECTION CONTINUES ON THE FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College –Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section Includes: Rough carpentry work.

1.03 SUBMITTALS

- A. General: Submit each item according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Refer to "Submittal Requirements and Schedule" Article at end of this Section for required submittals.

1.04 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01091 for information concerning availability and use of references.

American Wood Preservers Bureau (AWPB)
American Plywood Association (APA)
U.S. Department of Commerce (USDC)
U.S. Department of Commerce Product Standard (PS)
West Coast Lumber Inspection Bureau (WCLIB)
Western Wood Products Association (WWPA)
Redwood Inspection Service (RIS)

1.05 SUBMITTALS

- A. Comply with Division 1 Section "Submittals".
- B. Refer to "Submittal Requirements and Schedule" article at end of this Section.

1.06 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies.

1. Rough carpentry shall conform to the 2013 California Building Code.
2. Framing anchors shall be furnished and installed in accordance with the manufacturer's current ICBO Evaluation Report.

B. Grade Marks:

1. Identify lumber by the official grade mark of WCLIB, WWPA or RIS.
2. Identify plywood by the official grade mark of APA.
3. Identify pressure preservative treated lumber and plywood with the official grade mark of AWPB.
4. All lumber and plywood shall bear official grade mark.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the site in an undamaged condition.
- B. Storage lumber and plywood at the site under cover or otherwise protected against exposure to weather, raise above the ground and out of the contact with other damp or wet surfaces. Stack lumber and plywood and provide for air circulation within and around the stacks and under temporary coverings. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.

1.08 PROJECT CONDITIONS

- A. Cooperate with other trades in coordinating their work with the work of this section. Provide wood grounds, blocking and nailers where indicated or as required for integration of work of other trades into the structure.

PART 2 PRODUCTS

2.01 LUMBER

- A. Lumber Standards: Manufacture lumber to comply with PS 20-70 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies specified herein.
- B. Moisture Content at Time of Placing:
 1. Untreated Lumber: Maximum 19 percent.
 2. Treated Lumber: Maximum 19 percent after pressure treatment.
- C. Sizing and Surfacing: Sizes indicated are nominal; provide actual sizes in accordance with PS 20-70. Provide dressed lumber, S4S, except as otherwise indicated.

- D. Dimension Lumber: Provide lumber of the grades and species listed below for the various purposes, graded in accordance with WCLIB "Standard Grading Rules No. 16", 1984 Edition, WWPA "Western Lumber Grading Rules 88", or RIS "Standard Specifications for Grades of California Redwood Lumber," 1984 Edition.
1. Cants, Roof Nailers, and Roof Curbs: Standard or better grade Light Framing; No. 2 or better grade Structural Light Framing; or Stud grade of any commercial softwood species, pressure preservative treated.
 2. Sill Plates: No.1 Grade, or better, pressure preservative treated Douglas fir or Larch.
 3. Blocking, Nailers and Bracing: Standard or better grade Light Framing; No. 2 or better Structural Light Framing; or Stud grade of any commercial softwood species.
 4. Studs and Top Plates: No. 1 Grade Douglas fir or Larch.
 5. Joists, Headers, Ledgers, and Stair Stringers: No. 1 or better grade Joists and Planks of Douglas fir or Larch.
 6. Rafters: No. 1 grade Structural Light Framing of Douglas fir or Larch.
 7. Beams, Girders, and Stringers: No. 1 Grade Beams and Stringers of Douglas fir or Larch.
 8. Columns and Posts: No. 1 Grade Posts and Timbers of Douglas fir or Larch.

2.02 PLYWOOD

- A. Plywood Standards: Manufacture plywood to comply with U.S. Product Standard PS 1-95 for Construction and Industrial Plywood. All plywood structural panels, used in applications exposed to weather shall be classified for Exterior usage. All plywood structural panels used in locations not exposed to weather shall be classified for either Exterior or Exposure 1 usage.

2.03 PRESSURE TREATMENT

- A. Preservative Treatment: Where lumber or plywood is indicated or specified herein to receive pressure preservative treatment, treat materials in accordance with AWPB LP-2. Complete fabrication of treated items before treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.

2.04 MISCELLANEOUS MATERIALS

- A. Rough Hardware:

1. Furnish items of rough hardware, connections, bolts, required to complete the work. Where carpentry work is exposed to weather, in ground contact, or in area of high relative

humidity, provide nails, bolts, nuts, washers and other fasteners with a hot-dipped zinc coating in accordance with ASTM A 153-82.

2. Nails: Common wire. Use ring or spiral shank nails where indicated.
 3. Bolts: Standard mild steel, square or hexagonal head machine bolts with matching nuts and cut washers, or carriage bolts with square or hexagonal nuts and cuts washers as indicted. Where exposed to view, use only hexagonal head fasteners and matching nuts, and limit projection of bolt beyond face of nut to 1/2 inch.
 4. Lag Bolts and Screws: Sizes indicated.
 5. Toggle Bolts: Sizes indicted.
- C. Powder Driven Fasteners: Provide fastener system complete with all necessary washers, nuts and other appurtenances. Acceptable products, or equal:

Hilti Fastening Systems, Inc.
Powder Power Tool Corp.; Drive-It
Ramset Fastening Systems

- D. Framing Connectors: Provide galvanized steel joist hangers and other framing accessories having the minimum design and load capacities indicated. Load capacities shall be those shown in the manufacturer's current ICBO Evaluation Report. Acceptable manufacturers, or equal:

Simpson Strong-Tie Company Inc.
K.C. Metal Products; Superspeed Connectors
Silver Metal Products, Inc.
Union Steel Connectors

2.05 MISCELLANEOUS ITEMS

- A. Rough carpentry work and miscellaneous items and their related components are not necessarily individually described. The most important features and those requiring detail description are mentioned. Furnish rough carpentry work and miscellaneous items not mentioned or described and install in accordance with the intent of the drawings and specifications and as required to complete the work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Before commencing work, check concrete foundations, walls, curbs and other construction supporting rough carpentry work to ensure that they are set to the lines and levels indicated within the specified tolerances. Do not proceed until discrepancies have been corrected or adjusted.

3.02 INSTALLATION

- A. Install wood framing making proper provisions for work of other trades. Provide wood framing required to accommodate plumbing, heating and ventilating, electrical, and other trades. Fit neatly around exposed items, such as outlet boxes, conduit, pipes, and ducts.

- B. Wood Grounds, Nailers, Blocking and Sleepers:
 - 1. Provide wherever indicated and where required for screeding or attachment of other work. Form to shapes as indicated and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
 - 2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Where possible, anchor to formwork before concrete placement.
 - 3. Provide permanent grounds of dressed, preservative treated, key bevelled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

- C. Wood Furring:
 - 1. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.
 - 2. Furring to Receive Gypsum Board: Provide 1" by 2" furring at 16 inches on center, vertically, unless otherwise indicated.
 - 3. Furring to Receive Lath and Plaster: Provide 1" by 2" furring at 16 inches on center, vertically, unless otherwise indicated.
 - 4. Suspended Furring: Provide size and spacing indicated, including hangers and attachment devices. Level to a tolerance of 1/8 inch in 10 feet, except 1/4 inch in 10 feet for plaster.

- D. Wall Framing:
 - 1. Provide single plate at bottom and double at top, except as otherwise indicated. Stagger splices in top plates not less than 48 inches except as otherwise indicated. Reinforce plates on both sides which are cut for the passage of pipes and similar items, with 16 gage by 2-1/16" by 24" steel straps punched for 28-16d nails.
 - 2. Anchor sill plates of exterior and interior shear walls to concrete foundations with fasteners of size, length and spacing indicated.

3. If treated sill plates are cut, notched or bored, treat all such raw cut surfaces with heavy brush coat of same chemical used for treatment.
 4. Furnish and set columns and studding of size, spacings, and locations indicated. Unless indicated otherwise, studding for furring and partitions shall be 2" by 4" set 16 inches on center. Extend cripples to the floor plates. Install blocking in studding over 8 feet tall at half height, and at ceiling lines, double-nailed at each end. Construct corners and intersections with not less than 3 studs.
 5. Frame openings with full height double jamb studs and headers of sizes indicated. Set headers on separate trimmer studs and nail securely.
- E. Joist Framing: Set joists with the crown edge up with minimum 1-1/2 inch bearing on wood or metal supports. Where openings occur, headers and supporting joists shall be doubled and headers and tail joists shall be hung on metal hangers.
1. Framing system and sizes shall be as indicated. Install solid blocking at ends and over supports. Provide 2" by 3" cross-bridging, metal bridging or solid blocking in spans where indicated or at 8 feet on center in spans over 10 feet where not indicated.
 2. Lap joists framing from opposite sides of beams, girders or partitions not less than 4 inches or structurally tie opposing members together with metal framing connectors. Over supports provide solid blocking of same size as joists.
 3. Install joist hangers where indicated using nails of sizes and types listed in manufacturer's ICBO Evaluation Report.
 4. Include furring or stripping, properly shimmed and leveled, where indicated or required for ceiling finishes.
- E. Fire Blocking: Install as indicated and where required by the CBC.
- F. Openings: Provide openings for mechanical and electrical equipment, ducts, other equipment. Where one or more joists are cut, the joists supporting the trimmers shall be doubled and well spiked.
- G. Except as detailed, avoid cutting, drilling or notching wood members that may weaken the member. Lay out framing so that structural members will be subject to a minimum of cutting for openings, pipes, vents, ducts.
- H. Refer to 2314A.3, CBC, for installation requirements for plywood sheathing.

3.03 LUMBER FASTENINGS

- A. Nailing and bolting of wood members shall conform to the minimum requirements of the 1995 CBC, Chapter 23A, and as specified herein and as indicated.

- B. Bolting: Bolts shall be standard stock machine bolts as specified. Drill holes in wood member 1/16 inch larger than nominal bolt diameter. Exposed bolts shall be all hexagonal head with matching nuts. Retighten bolted connections before final acceptance or, in the case of bolted connections in concealed locations, immediately before the area is sealed off.
- C. Lag Bolts (or Lag Screws): Provide prebored lead holes for all lag bolts. Drill lead hole for the shank to a depth equal to the length of the unthreaded portion in the main member, using a drill of the same diameter. Continue lead hole with a drill whose diameter is 60 percent of the nominal lag bolt diameter. Insert lag bolt into lead hole by turning with a wrench, and not by driving with a hammer. Use soap, beeswax or other lubricant to facilitate installation.
- D. Nailing: Connections shall be as indicated in the 1995 CBC Table 23A-I-Q where not otherwise indicated. Nails shall be untreated steel for interior work and concealed framing, and galvanized for all exposed work on exterior. Unless connectors are detailed or steel connectors indicated, nails shall not be driven closer together than ½ of their length nor closer to the edge of a member than 1/4 their length. When wood tends to split with size of nail used, predrill holes for nails. Penetration of nails or spikes into pieces shall be not less than one-half the length of the nail or spike. Use of machine nailing is subject to a satisfactory jobsite demonstration for each project and the approval of the project architect or structural engineer and the enforcement agency. The approval is subject to continued satisfactory performance. Machine nailing is not allowed for 5/16-inch (7.9mm) plywood. If the nail heads penetrate the outer ply more than would be normal for a hand-held hammer, or if minimum allowable edge distances are not maintained, the performance will be deemed unsatisfactory and machine nailing shall be discontinued.
- E. Washers: Provide all bolts and lag screws bearing on wood with cut washers except where malleable iron or plate washers are indicated on the structural drawings.
- F. Metal Framing Connectors: Install connectors in accordance with the manufacturer's current ICBO Evaluation Report. Fill all holes in each connector with proper size nails intended for this use. The use of a nailing gun for installation of such connectors is expressly prohibited.

3.04 ROUGH HARDWARE

- A. Furnish and install all stock items of rough hardware as indicated or required, including clips, anchors, hangers, bolts, ties, and plates for connecting wood framing members to wood, concrete, or steel, except as specified to be provided under other Sections.

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SECTION 072100 – THERMAL AND SOUND INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sound insulation in interior and interior infill stud walls.
- B. Related Requirements:
 - 1. Division 09 Section "Gypsum Board."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of exposed product, in manufacturer's standard-size Samples but not less than 4 inches square.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials of this Section shall provide continuity of acoustic barrier at building enclosure elements.
- B. Materials of this section shall provide a flame spread of 25 (FS-25) and smoke developed of 50, per ASTM E84-80. Combustion characteristics per ASTM E136, fire resistance rating per ASTM E119.

2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide batt or blanket products by one of the following manufacturers.
 - 1. CertainTeed Corporation.
 - 2. Johns Manville.
 - 3. Owens-Corning Fiberglass Corporation
 - 4. USG Interiors, Inc.

2.3 SOUND INSULATION – BATT OR BLANKET TYPE

- A. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- B. Sound insulation shall be installed in interior partitions as follows:
 - 1. At all new interior walls and partitions.
 - 2. Minimum Thickness: 4-inches.
- C. Provide accessories to mitigate the passage of sound, including adhesives, duct tape, tie wires and other accessories as recommended by the insulation manufacturer.
- D. Provide acoustical sealant where indicated on the Drawings. Acoustic sealant shall be a one component elastomeric sealant as specified in Section 07 92 00.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- 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 envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
- C. Clean by vacuuming.

3.4 PROTECTION

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

THIS SECTION CONTINUED ON THE FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College –Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 072100

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Acoustical joint sealants.
- B. Related Sections:
 - 1. Division 01 Section "Indoor Air Quality (IAQ) Management."
 - 2. Division 09 Section "Gypsum Board" for sealing perimeter joints.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. All construction joints, structural or mechanical or electrical penetrations, recessed boxes or fixtures, etc. shall be installed airtight to prevent sound transmission through building construction or from one room to another. The responsibility for airtight construction shall fall on the general contractor and all subcontractors who must coordinate their work in the field.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.

4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Environmental Submittals:

Reference Standard: California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen)

1. Product data for sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L.

B. Qualification Data: For qualified Installer.

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

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

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Field-Adhesion Test Reports: For each sealant application tested.

G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose Work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 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 materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage to moisture, high or low temperatures, contaminants, or other causes.

1.7 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 or are below 40 deg F (4.4 deg C).
 - 2. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less 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.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive District of other rights District may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Three years from date of Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 1. Colors of Exposed Joint Sealants: Match adjacent material, except if two materials are present, obtain color selection from Architect from manufacturer's full range of colors.
- B. All sealants to be field-applied, within the building envelope must comply with VOC limits in Division 01 Section "Indoor Air Quality (IAQ) Management".

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemical curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C920 classifications for type, grade, class, and uses.

2.4 LATEX JOINT SEALANTS

- A. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.

2.5 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
 - 2. Type O: Open-cell material.
 - 3. Type B: Bicellular material with a surface skin.
 - 4. Type: Any material indicated above, provided it is compatible with sealant and materials adjacent.
- C. Elastomeric Tubing Sealant Backing: Neoprene, Butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 AIRTIGHT EXECUTION

- A. Partition Bases: Provide ¼" (high) continuous bead of acoustical sealant at all locations where gypsum board meets structural flooring. The depth of the sealant shall equal the thickness of the gypsum layer or layers.
- B. Partition Heads: Provide the same detail as for bases at flat structure or decking with flutes parallel to the partition. Where heads meet decking with flutes perpendicular to the partition, cut gypsum board escutcheons to fit flutes and install over outer layers of gypsum board on both sides of partition, then caulk as described above.
- C. Partition or Ceiling Joints at Dissimilar Materials: Provide ¼" continuous bead of acoustical sealant at all locations where gypsum board meets dissimilar material. The depth of the sealant shall equal the thickness of the gypsum layer or layers.
- D. Partition Ends at Window Mullions: Attach single or multiple layers of gypsum board (matching the partition) continuously over the exposed sides of the window mullion. Caulk resulting joints at the wall end at the window glass.
- E. Partition/Partition or Partition/Ceiling Joints: Provide standard corner taping detail.
- F. Pipe, Duct, Conduit, or Structural Penetrations: Provide ¼" wide bead of acoustical sealant around perimeter of each penetrating element. The depth of the sealant shall equal the thickness of the gypsum layer or layers.
- G. Electrical Boxes 4" x 4" or under: Provide ¼" wide bead of acoustical sealant around perimeters of electrical boxes. The depth of the sealant shall equal the thickness of the gypsum layer or layers. Provide sheet caulking (e.g. Lowry Pads) continuous around the back side of boxes.

- H. Electrical, Lighting, or Other Recessed Boxes Over 4" x 4": Provide one layer of 5/8" gypsum board continuous around the back of such boxes. Caulk or tape all joints and caulk all conduit penetrations with acoustical sealant.

3.2 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.

3.3 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 substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.4 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at positions required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints. Do not allow 3-sided bond of sealants.
- E. Install sealants by proven techniques to 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 provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.5 CLEANING

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

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of 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.

3.7 ELASTOMERIC JOINT-SEALANT SCHEDULE

- A. Low-Modulus Nonacid-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
1. Products: Provide one of the following, or approved equal:
 - a. 795; Dow Corning, or approved equal by GE, or Tremco.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Hardness: 36.
 4. Class: 25.
 5. Use Related to Exposure: NT (nontraffic).
 6. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 7. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
 8. Applications: Use for exterior vertical surfaces where sealant is not to be painted.
- B. Mildew-Resistant Silicone Sealant: Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior nonporous substrates that are subject to in-service exposures or high humidity and temperature extremes, and that comply with the following:
1. Products: Provide one of the following, or approved equal:
 - a. 786 Mildew Resistant; Dow Corning.
 - b. Sanitary 1700; GE Silicones.
 - c. 898 Silicone Sanitary Sealant; Pecora Corporation.
 - d. Tremsil 600 White; Tremco.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated O.
 6. Applications: Use at plumbing fixtures.
- C. Multicomponent Nonsag Urethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
1. Products: Provide one of the following or equal:

- a. Chem-Calk 2000; Bostik Inc.
 - b. Vulkem 227; Mameco International.
 - c. Vulkem 922; Mameco International.
 - d. Elasto-Thane 920 Gun Grade; Pacific Polymers, Inc.
 - e. Dynatred; Pecora Corporation.
 - f. PSI-270SL; Polymeric Systems, Inc.
 - g. NP 2; Sonneborn Building Products Div., ChemRex Inc.
2. Type and Grade: M (multicomponent) and NS (nonsag).
 3. Class: 25.
 4. Uses Related to Exposure: T (traffic).
 5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
 6. Applications: Use for exterior and interior joints subject to vehicle or pedestrian traffic.

3.8 LATEX JOINT-SEALANT SCHEDULE

- A. Latex Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
 1. Products: Provide one of the following, or approved equal:
 - a. Chem-Calk 600; Bostik, Inc.
 - b. LC 160 All Purpose Acrylic Caulk; Ohio Sealants, Inc.
 - c. AC-20; Pecora Corporation.
 2. Applications: Use for interior sealants in vertical surfaces that are to be painted.

THIS SECTION CONTINUED ON FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College –Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Interior hollow metal doors and frames.

- B. Related Sections:

- 1. Division 08 Section "Door Hardware"
 - 2. Division 09 Section "Non-Structural Metal Framing."
 - 3. Division 09 Sections "Gypsum Board."

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

- B. Environmental Submittals:

Reference Standard: California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen).

- 1. Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L.
 - 2. Provide documentation that all composite wood and agrifiber products including core materials and all laminating adhesives, on site or shop applied, contain no added urea-formaldehyde resins.

- C. Shop Drawings: Include the following:

- 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
3. Locations of reinforcement and preparations for hardware.
4. Details of each different wall opening condition.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

F. Other Action Submittals:

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

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

1.5 QUALITY ASSURANCE

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to 2010 CBC, Section 715.4.
- B. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to 2010 CBC, Section 715.5. Label each individual glazed lite.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1. Provide minimum 1/4-inch space between each stacked door/frame to permit air circulation.

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION

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

1.9 WARRANTY

- A. Manufacturer's Warranty: Furnish manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of other rights Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 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. Ceco Door Products; an Assa Abloy Group company (basis of design).
 2. Curries Company; an Assa Abloy Group company.
 3. Door Components, Inc.
 4. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

- A. Manufacture frames and frame components from commercial quality carbon steel conforming to ASTM designation A568 and A569 or hot-dipped galvanized steel having an A60 zinc-iron alloy coating conforming to ASTM designation A653. Embossed CE-Series EmCraft doors: hot-dipped galvanized steel face sheets having an A40 zinc-iron alloy coating conforming to ASTM designation A653. Treat galvanized steel to insure proper paint adhesion. Steel component parts used in galvanized doors and/or frames: match galvanized specification.
- B. Clean, phosphatized and finish all painted doors, frames and frame components with one coat of rust inhibiting prime paint in accordance with ANSI A250.10.
- D. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick steel sheet; galvanized steel or galvanized steel where used with galvanized steel frames.

- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, comply with ASTM A 153, Class C or D as applicable.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

- B. Interior Hollow Metal Doors:

1. Series: Ceco "Regent (RI)"
2. Design: Flush panel.
3. Thickness: 1 3/4".
4. Physical Performance: Level A according to SDI A250.4
5. Panel: 18 gauge cold rolled steel.
6. Core Construction: Manufacturer's honeycomb.
 - a. containing no added urea-formaldehyde resins.
 - b. Fire Door Core: As required to provide fire-protection ratings indicated.
7. Vertical Edges: Full height, epoxy-filled mechanical interlock.
8. Top and Bottom Edges: Closed with inverted 0.042-inch- thick, channels of same material as face sheets.
9. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

- D. Interior Hollow Metal Door Frames without Sidelights/Windows:

1. Series: Ceco SQ, SR, SC Steel Frames
2. Material: 16 gauge cold rolled steel.
3. Finish: Primed with oven-cured neutral color primer.

- E. Interior Hollow Metal Door Frames with Sidelights/Widows:

1. Series: Ceco "Standard" Welded Frames
2. Material: 16 gauge cold rolled steel.
7. Core Construction: Manufacturer's polystyrene.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.
8. Vertical Edges: Full height, epoxy-filled mechanical interlock.
9. Top and Bottom Edges: Closed with stainless steel flush cap, same material as face sheets.

2.4 FRAME ANCHORS

- A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.5 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.
- C. Hollow Metal Frames:
 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Members at crossings and to jambs by butt welding.
 3. Provide countersunk, flat- or oval-head exposed screws for exposed fasteners.
 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Four anchors per jamb from 60 to 90 inches high.
 - 2) Five anchors per jamb from 90 to 96 inches high.
 - 3) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

F. Stops and Moldings: Provide stops where indicated. Form corners of stops with butted or mitered hairline joints.

2.6 PAINTED STEEL FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - c. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

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

1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 1/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 1/8 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.

THIS SECTION CONTINUED ON FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College – Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 081113

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SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Door Hardware.
2. Cylinders for doors fabricated with locking hardware.
3. Installation of door hardware provided in this section.
4. Replacement of door hardware on existing door.

B. Related Sections:

1. Division 08 Section "Hollow Metal Doors and Frames."

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Conduit, junction boxes & wiring.
8. Folding partitions, except cylinders where detailed.
9. Sliding aluminum doors, except cylinders where detailed.
10. Access doors and panels, except cylinders where detailed.
11. Corner guards.
12. Wrought iron railing gates and supports.

1.3 REFERENCES

Use date of standard in effect as of Bid date.

- A. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
- B. BHMA – Builders Hardware Manufacturers Association
- C. DHI – Door and Hardware Institute
- D. NFPA – National Fire Protection Association

1. NFPA 80 – Fire Doors and Windows
2. NFPA 105 – Smoke and Draft Control Door Assemblies
3. NFPA 252 – Fire Tests of Door Assemblies

E. UL – Underwriters Laboratories

1. UL10C – Positive Pressure Fire Tests of Door Assemblies.
2. UL 305 – Panic Hardware

F. WHI – Warnock Hersey Incorporated

G. State of California Building Code

H. Local applicable codes

I. SDI – Steel Door Institute

J. WI – Woodwork Institute

K. AWI – Architectural Woodwork Institute

L. NAAMM – National Association of Architectural Metal Manufacturers

1.4 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Section 01330. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Type, style, function, size, quantity and finish of hardware items.
2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Description of door location using space names and numbers as published in the drawings.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, handing, materials, fire-rating and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Wiring Diagrams.
12. Manufacturer’s technical data and installation instructions for electronic hardware.
13. Date of jobsite visit.

B. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.

- C. Deviations: Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.
- D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.
- E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.
- F. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.
- G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.
 - a. Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.
- B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.
- C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.
 - 1. Note: scheduled resilient seals may exceed selected door manufacturer's requirements.
 - 2. See 2.6.E for added information regarding resilient and intumescent seals.
- E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: coordinate delivery to appropriate locations (shop or field).
 - 1. Permanent keys and cores: secured delivery direct to Owner's representative.
- B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.
- C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.7 PROJECT CONDITIONS AND COORDINATION

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.
- B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:
 - 1. Location of embedded and attached items to concrete.
 - 2. Location of wall-mounted hardware, including wall stops.
 - 3. Location of finish floor materials and floor-mounted hardware.
 - 4. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
 - 5. Manufacturer templates to door and frame fabricators.
- C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation. Do not order hardware until the submittal has been reviewed by the frame and door suppliers for compatibility with their products.
- D. Prior to submittal, carefully inspect existing conditions at each opening to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict or incompatibility between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
 - 1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.8 WARRANTY

- A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties:

1.	Locksets:	Three years
2.	Exit Devices:	Three years mechanical One year electrical
3.	Closers:	Ten years mechanical Two years electrical
4.	Other Hardware	Two years

1.9 COMMISSIONING

- A. Conduct these tests prior to request for certificate of substantial completion:
1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
 2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.

1.10 REGULATORY REQUIREMENTS

- A. Locate latching hardware between 34" to 44" above the finished floor, per California Building Code, Section 1008.1.9.2 and 11B-404.2.7.
1. Locate panic hardware between 36" to 44" above the finished floor.
- B. Handles, pull, latches, locks, other operating devices: readily openable from egress side without tight grasping, tight pinching, or twisting of the wrist to operate. California Building Code 1008.1.9.1.
- C. Adjust doors to open with not more than 5.0 lbs pressure to open at exterior doors and 5.0 lbs at interior doors. As allowed per California Building Code, Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15 lbs.
- D. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per California Building Code Section 11B-404.2.8.1.
- E. Smooth surfaces at bottom 10" of push sides of doors, facilitating push-open with wheelchair footrests, per California Building Code Section 11B-404.2.10.
- F. Door opening clear width no less than 32", measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a

factor in clear width if located above 34" and the hardware projects no more than 4". California Building Code Section 11B-404.2.3, 11B-404.2.4, and 1008.1.1.

- G. Door opening clear height no less than 80" measured from top of sill to bottom of frame header stop. Projections into clear opening height not to exceed 4". California Building Code Section 11B-404.2.3 and 1008.1.1.1.
- H. Thresholds: Floor or landing no more than 1/2" below the top of the threshold of the doorway. Change in level between 1/4" and 1/2": beveled to slope no greater than 1:2 (50 percent slope). California Building Code Section 11B-404.2.5.
- I. Floor Stops: Do not locate in path of travel. Locate no more than 4" from walls, per DSA Policy #99-08 (Access).
- J. Pairs of Doors: Limit swing of one leaf to 90 degrees to protect persons reading wall-mounted tactile signage.

SECTION CONTINUES ON FOLLOWING PAGE

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Listed Acceptable Alternate Manufacturers: Submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE SUB:
Hinges	(IVE) Ives	Bommer
Continuous Hinges	(IVE) Ives	Pemko
Pivots	(BOM) Bommer	
Key System	(SCH) Schlage	District Standard
Locks	(SCH) Schlage	District Standard
Electronic Locks	(SCE) Schlage Electronics	District Standard
Exit Devices	(VON) Von Duprin	District Standard
Closers	(LCN) LCN	District Standard
Coordinators	(IVE) Ives	DCI
Silencers	(IVE) Ives	Trimco
Push & Pull Plates	(IVE) Ives	Trimco
Kickplates	(IVE) Ives	Trimco
Stops & Holders	(IVE) Ives	Trimco
Thresholds	(ZER) Zero	NGP
Seals & Bottoms	(ZER) Zero	NGP
Actuators	(WIK) Wikk Industries	
Door Alarm	(ALA) Alarm Lock	

2.2 HINGING METHODS

- A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.
- B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.
- C. Conventional Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.
 - 1. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.
 - 2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
- D. Continuous Hinges:
 - 1. Geared-type aluminum.
 - a. Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
 - 2. Pinned steel/stainless steel type: continuous stainless steel, 0.25-inch diameter stainless-steel hinge pin.
 - a. Use engineered application-specific wide-throw units as needed to provide maximum swing degree of swing, advise Architect if required width exceeds 8 inches.
- E. Pivots: High-strength forged bronze or stainless steel, tilt-on precision bearing and bearing pin.
 - 1. Bottom and Intermediate pivots: Adjustability of minus 1/16 inch, plus 1/8 inch.
- F. Floor Closers: Hydraulically controlled, cement case, maximum degree dead stop permitted by trim or adjacent structure. Special pins, floor pans and longer spindles when needed to accommodate floor and jamb conditions.

2.3 LOCKSETS, LATCHSETS

- A. Mortise Locksets and Latchsets: As scheduled.
 - 1. Chassis: Cold-rolled steel, handing field-changeable without disassembly.
 - 2. Latchbolts: 3/4 inch throw stainless steel anti-friction type.

3. Lever Trim: Through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
 - a. Spindles: Security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
4. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
5. Thumbturns: Accessible design not requiring pinching or twisting motions to operate.
6. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
7. Scheduled Lock Series and Design: Schlage L series, 06A design.
8. Certifications:
 - a. ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
 - b. ANSI/ASTM F476-84 Grade 31 UL Listed.
9. Comply with CBC Section 11B-304.4.

B. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled.

1. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel, through-bolted.
2. Locking Spindle: stainless steel, integrated spring and spindle design.
3. Latch Retractors: forged steel. Balance of inner parts: corrosion-resistant plated steel, or stainless steel.
4. Latchbolt: solid steel.
5. Backset: 2-3/4" typically, more or less as needed to accommodate frame, door or other hardware.
6. Lever Trim: Accessible design, independent operation, spring-cage supported, minimum 2" clearance from lever mid-point to door face.
7. Strikes: 16 gage curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
8. Lock Series and Design: Schlage ND series, "Rhodes" design.
9. Certifications:
 - a. ANSI A156.2, 1994, Series 4000, Grade 1.
 - b. UL listed for A label and lesser class single doors up to 4ft x 8ft.
10. Comply with CBC Section 11B-304.4.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General Features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.

3. 0.75-inch throw deadlocking latchbolts.
4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Where devices span over door lite frame and the face of the selected lite manufacturer's frame is raised from the face of the door, furnish panic hardware manufacturer's fitted shims or glass-bead kits at no additional cost to the project.
8. Accessibility: Require not more than 5 lb. to retract the latchbolt, per CBC 2013 11B-404.2.7.

2.5 CLOSERS

A. Surface Closers:

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.
4. Non-sized and adjustable. Place closers inside building, stairs and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Advanced Variable Backcheck (AVB): where scheduled, these units commence backcheck at approximately 45 degrees.
7. Adjustable to open with not more than 5.0lbs pressure to open at exterior doors and 5.0lbs at interior doors. As allowed per California Building Code, Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15lbs.
8. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
9. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units. EDA arms: rigid main and forearm, reinforced elbow.
10. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
11. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
12. Non-flaming fluid, will not fuel door or floor covering fires.
13. Pressure Relief Valves (PRV) not permitted.

- B. Low-Energy Door Operators: Comply with ANSI/BHMA 156.19 Electric power-open, hydraulically checked spring power closing. Modular construction. Finished metal cover. Field-adjustable opening force, opening speed, time-open, closing and latching speeds. Door reopens and timing cycle restores if system reactivated during closing cycle. Breakaway clutch protection from forced closing. Door, frame, motor and drive train protected by attenuated initiation of opening cycle.

2.6 OTHER HARDWARE

- A. Kick Plates: Four beveled edges, 0.050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.
- B. Door Stops: Provide stops to protect walls, casework or other hardware.
 - 1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.
 - 2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90 degree stop / 95 degree deadstop. Note degree of opening in submittal.
- C. Seals: Finished to match adjacent frame color. Resilient seal material: polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Do not furnish vinyl seal material. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability.
 - 1. Proposed Substitutions: Submit for approval.
 - 2. Solid Neoprene: MIL Spec. R6855-CL III, Grade 40.
 - 3. Non-corroding fasteners at in-swinging exterior doors.
 - 4. Fire-rated Doors, Resilient Seals: UL10C compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive-mounted resilient seal, furnish rigid housed seal at minimum, or both the rigid housed seal plus the adhesive applied seal. Adhesive applied seals alone are deemed insufficient for this project where rigid housed seals are scheduled.
 - 5. Fire-Rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required
- D. Thresholds: As scheduled and per details. Comply with CBC Section 11B-404.2.5. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.
 - 1. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).

2. Fire-rated openings, 90min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.
 3. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
 4. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.
- E. Exposed Through-Bolts: Do not use SNB, grommet nuts, sleeve nuts or other such clamping type fasteners, intent is for minimal exposed hardware. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.
- F. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

2.7 FINISH

- A. Generally BHMA 626 Satin Chromium.
1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.
- B. Door Closers: Factory powder coated to match other hardware, unless otherwise noted.
- C. Aluminum Items: Match predominant adjacent material. Seals to coordinate with frame color.

2.8 KEYING REQUIREMENTS:

- A. Key System: Schlage Primus utility-patented keyway, interchangeable core throughout. Key blanks available only from factory-direct sources, not available from after-market keyblank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and Allegion Consultants representatives to determine system keyway(s), keybow styles, structure, degree of physical security and degree of geographic exclusivity. Furnish Owner's written approval of the system.
1. New master key system.
 2. Primus Level 3.
 3. Construction keying: furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
 4. Temporary cylinders/cores remain supplier's property.
 5. Furnish 5 construction keys.
 6. Furnish 2 construction control keys.
 7. Key Cylinders: furnish 6-pin solid brass construction.

- B. Cylinders/Cores: Keyed at factory of lock manufacturer where permanent records are maintained. Locksets and cylinders same manufacturer.
- C. Permanent Keys: Use secured shipment direct from point of origination to Owner.
 - 1. For estimate: 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
 - 2. For estimate: VKC stamping plus "Do Not Duplicate".
- D. Bitting List: Use secured shipment direct from point of origination to Owner at completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS

- A. Can read and understand manufacturers' templates, suppliers' hardware schedules and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.2 PREPARATION

- A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation.
- B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
 - 1. Notify Architect of code conflicts before ordering material.
 - 2. Locate levers, key cylinders, t-turn pieces, touchbars and other operable portions of latching hardware between 30 inches to 44 inches above the finished floor, per CBC Section 11B-404.2.7.
 - 3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.
- C. Overhead Stops: Before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.
- D. Existing frames and doors to be retrofitted with new hardware:
 - 1. Field-verify conditions and dimensions prior to ordering hardware. Fill existing hardware cut outs not being reused by the new hardware. Remove existing hardware not being reused, return to Owner unless directed otherwise.

3.3 INSTALLATION

- A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true

to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets: Install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
 2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
 3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
 4. Replace fasteners damaged by power-driven tools.
- B. Locate floor stops no more than 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.
- C. Locate overhead stops for minimum 90 degrees and maximum allowable degree of swing.
- D. Drill pilot holes for fasteners in wood doors and/or frames. Centerpunch hole locations before using self-drilling type screws to prevent skating. Replace screws that are not centered in their holes.
- E. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4 ADJUSTING

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner's satisfaction.
 2. Adjust doors to fully latch with no more than 1 pound of pressure.
 3. Adjust door closers per 1.9 this section.

3.5 DEMONSTRATION

- A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.
- B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

HW SET: 01

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	CD98NL X 990NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	MORTISE CYLINDER	20-061 XQ11-948 (DOGGING)	626	SCH
2	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
1	SET	SEALS	188S HEAD AND JAMBS	BLK	ZER
2	EA	THRESHOLD	268A		ZER
1	EA	THRESHOLD	269A		ZER
1	EA	THRESHOLD	676A-E, 36" LONG		ZER

HW SET: 02

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
2	EA	THRESHOLD	268A		ZER
1	EA	THRESHOLD	269A		ZER
1	EA	THRESHOLD	676A-E, 36" LONG		ZER

HW SET 03 (REMOVE EXISTING DOOR HARDWARE AND REPLACE)

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	CD98NL X 990NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	MORTISE CYLINDER	20-061 XQ11-948 (DOGGING)	626	SCH
2	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	THRESHOLD	268A		ZER
1	EA	THRESHOLD	269A		ZER
1	EA	THRESHOLD	676A-E, 36" LONG		ZER

BALANCE OF HARDWARE EXISTING

INTUMESCENT SEALS BY DOOR MANUFACTURER

Date: _____ Project Name: Antelope Valley College – Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District
(Specification Section) (Owner)

and _____
(the "Contractor") Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 087100

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
- B. Related Requirements:
 - 1. Division 06 Section "Rough Carpentry" for systems that support gypsum board panels.
 - 2. Division 09 Section "Interior Painting."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including all auxiliary materials.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
 - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wall coverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: Subject to compliance with requirements, provide products indicated by CertainTeed Corporation; or comparable products by one of the following:
 - 1. Georgia-Pacific Gypsum LLC.
 - 2. USG Corporation.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Low Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers." Provide proof of performance requirements.

2.3 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 60 percent.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.4 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Curved-Edge Cornerbead: With notched or flexible flanges.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Pre-filling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 flat, smooth finish, use drying-type, all-purpose compound.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

- B. Steel Screws: ASTM C 1002-14.
 - 1. Use SPAX Multi-material Construction Screws, Flat Head and Full Thread for fastening panels to wood members.
- C. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. USG Corporation; SHEETROCK Acoustical Sealant.
 - b. Pecora Corporation; AC-20 FTR AIS-919.
 - c. Grabber Construction Products; Acoustical Sealant GSC.
 - 2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - a. All sealants and adhesives to be field-applied, within the building envelope must comply with VOC limits in Division 01 Section "Indoor Air Quality (IAQ) Management".

2.8 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. USG Corporation; SHEETROCK Ceiling Spray Texture, QT.
 - b. National Gypsum Company; ProForm Perfect Spray.
 - c. Georgia-Pacific Gypsum LLC; ToughRock Ceiling Textures/Polystyrene.
 - 2. Texture: Fine.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- C. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- D. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc., except in chases braced internally).
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
- E. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- G. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On partitions/walls, apply gypsum panels (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

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

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 4: At All Locations.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.6 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture flat, smooth, free of starved spots or other evidence of thin application or of application patterns. Provide mockup for approval before proceeding with finish.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

THIS SECTION CONTINUED ON FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College –Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 092900

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient moldings (floor transitions).
- B. Related Sections:
 - 1. Division 01 Section "Indoor Air Quality (IAQ) Management".

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 4 inches long, of each resilient product color, texture, and pattern required.
- D. Environmental Submittals:
 - Reference Standard: California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen).
 - 1. Provide Project Data: For installation adhesive, documentation including printed statement of VOC content.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide "Roppe" 1602 North Union Street, Fostoria, OH 44820, (800) 537-9527, Local Representative Contact: Lil Turner (760) 435-1158, lturner@roppe.com, or approved equal.

2.2 RESILIENT BASE

- A. Rubber Wall Base
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Roppe Corp, USA, "Pinnacle" or equal.
 - 2. Resilient Base Standard: ASTM F 1861.
 - 3. Material Requirement: Type TS (rubber, vulcanized thermoset).
 - 4. Manufacturing Method: Group I (solid, homogeneous).
 - 5. Style: Cove (base with toe).
 - 6. Minimum Thickness: 0.125 inch.
 - 7. Height: 4 inches.
 - 8. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
 - 9. Outside Corners: Job formed or preformed.
 - 10. Inside Corners: Preformed.
 - 11. Finish: Matte.
 - 12. Color: T.B.D.

2.3 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, provide as Basis of Design, products, as shown on drawings, by:
 - a. Roppe, 1602 North Union Street, Fostoria, OH 44820, (800) 537-9527, Local Representative Contact: Lil Turner (760) 435-1158, lturner@roppe.com, or approved equal.

B. Products:

1. Vinyl Reducer Trim.
 - a. Profile and Dimensions: As indicated in Detail Drawings.
 - b. Colors and Patterns: As selected by Architect from full range of industry colors.
2. Vinyl Transition Trim.
 - a. Profile and Dimensions: As indicated in Detail Drawings.
 - b. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 1. All sealants and adhesives to be field-applied, within the building envelope must comply with VOC limits in Division 01 Section "Indoor Air Quality (IAQ) Management".

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Contoured Base Corners: To be miter cut and fitted in the field using a compound miter saw.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

THIS SECTION CONTINUED ON FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College –Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 096513

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Gypsum Board
 - 2. Steel Door Frames
 - 3. Steel Doors
 - 4. Existing Concrete Slab Floor.
- B. Related Sections include the following:
 - 1. Division 01 Section "Indoor Air Quality (IAQ) Management".
 - 2. Division 08 Sections "Hollow Metal Doors and Frames" for factory priming doors with primers specified in this Section.
 - 3. Division 09 Section "Gypsum Board".

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on substrates they will be applied to, 8 in x 10" min.
 - 2. Label each Sample with paint system, color, gloss level, location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

- E. Environmental Submittals:

Reference Standard: California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen).

1. Provide Project Data:
 - a. For paint systems, documentation including printed statement of VOC content.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 PROJECT CONDITIONS

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

1.6 EXTRA MATERIALS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Dunn Edwards Corporation (basis of design)
 2. Frazee Paint
 3. PPG Coatings
 4. Devoe Coatings (basis of design for concrete floor coating).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- C. Prepare existing gypsum board surfaces that have had wallcovering removed by patching, sanding to remove adhesive, and prepping as necessary to achieve a Level 4 finish per ASTM C840 Drywall Finish Standards.
- D. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.
- E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Patched Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in occupied spaces including, but not limited to, the following:

1. Mechanical Work:
 - a. Un-insulated metal piping.
 - b. Un-insulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Metal ducts, without liner.
 - e. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - f. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
2. Electrical Work:
 - a. All exposed electric conduit.
 - b. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove non-complying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

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

SECTION CONTINUED ON NEXT PAGE

3.6 INTERIOR PAINTING SCHEDULE

- A. Type X Gypsum Board – Paint Type P25C:
1. 100% Acrylic System, Eggshell Finish (Gloss Level 10-15% on a 60° meter)
 - 1st coat: Dunn Edwards, ULTRA-GRIP Premium, Multi-Surface, Water-Based Primer, (50 g/L VOCs).
 - 2nd coat: Dunn Edwards, EVEREST, EVER30, 100% Acrylic, (2 g/L VOCs).
 - 3rd coat: Dunn Edwards, EVEREST, EVER30, 100% Acrylic, (2 g/L VOCs).
- B. Metal Doors and Metal Frames – Paint Type P28B:
1. Acrylic Urethane System, Semi-Gloss Finish (Gloss Level 40-50% on a 60° meter)
 - 1st coat: Dunn Edwards, BLOC-RUST Premium, BRPROO-2-WH, Rust Inhibitive Water-Based Primer, 50 g/L VOCs).
 - 2nd coat: Dunn Edwards, ULTRASHIELD, ULDM50, (0 g/L VOCs).
 - 3rd coat: Dunn Edwards, ULTRASHIELD, ULDM50, (0 g/L VOCs).
- C. Exposed Metal Mechanical miscellaneous metal (including unitrut) & Electrical Equipment – Paint Type P29D:
1. Fast-Drying, Non-bridging Waterborne Dry Fall Flat Finish
 - 1st coat: Dunn Edwards, AQUAFALL, AQUA10, (35 g/L VOCs).
 - 2nd coat: Dunn Edwards, AQUAFALL, AQUA10, (35 g/L VOCs).
- D. Concrete Flooring, Semi-Gloss High Performance Floor Coating P30:
- 1st Coat: Devoe Coatings Devran 224HS Solids Epoxy Coating [MPI #108]
(Thin 1st coat down to 15 -20%)
 - 2nd Coat: Devoe Coatings Devran 224HS Solids Epoxy Coating [MPI #108]
(2nd coat full strength)
 - 3rd coat: Devoe Coatings Devthane 378H Aliphatic Urethane Semi-Gloss Enamel [MPI #72]

NOTE: Include Slip resistant additive (acrylic sand) in with the Devthane and broadcast additional additive on top of wet final coat to provide a slip resistant surface that will meet ASTM C 1028 static coefficient of friction of min. 6.0 wet.

THIS SECTION CONTINUED ON FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College – Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District

(Specification Section)

(Owner)

and _____
(the "Contractor") Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 099123

SECTION 101423 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior Panel Signs: Fixed, frameless acrylic or photopolymer panel signs and accessories.
 - 2. Exterior Panel Signs: Fixed, frameless magnesium or zinc panel signs and accessories.
 - 3. All supplementary parts and components, hardware, mounting adhesives or other miscellaneous supports and materials required for a complete installation.
- B. Related Sections:
 - 1. Division 01 Section "Indoor Air Quality (IAQ) Management".
- C. Refer to Drawings for sign types and locations.
- D. Refer to Message Schedule for detail references on the Drawings.
- E. Installation of all signs.

1.3 REGULATORY REQUIREMENTS

- A. Comply with the Americans with Disabilities Act (ADA) and with code provisions adopted by the State of California, Division of the State Architect (DSA).
- B. Signage shall be in compliance with 2010 California Building Code (CBC) Sections 1003.2.8, 1114B, 1115B.5, and 1117B.

1.4 SUBMITTALS

- A. General: Submittal procedures are according to the Conditions of the Contract and Division 1 "Submittal Procedures".
- B. Submit product data. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

- C. Environmental Submittals:
Reference Standard: California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen).
2. Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L.
- D. Submit shop drawings to scale; indicating sign styles, large-scale details of wording, lettering font and height, Tactile and Braille layout including dimensions, Pictograms, foreground and background colors, fabrication methods, each sign location, edge details, mounting heights, and overall dimensions and thickness of each sign. Show attachments, layout, reinforcement, accessories, and installation/mounting details.
1. Sign Contractor is required to obtain an approved reviewed set of shop drawings (reviewed by the Architect) prior to fabricating any sign products.
- E. Submit proposed sign schedule for each sign, including message text/symbols and arrangement, sign location relative to room or door number, quantity, sign material and colors.
- F. Samples for Selection: For each type of sign material indicated, that involves color selection.
1. Provide samples approximately 4 inches square of each color selected.
- G. Project Specific samples for verification:
1. Must be reviewed prior to fabrication.
 2. Provide two samples each of the following specified sign types for each material used:
 - a. Interior Panel Signs: Tactile and Non-Tactile.
 - b. Exterior Panels Signs: Tactile and Non-Tactile.
 - c. Submit an initial series of changeable paper inserts (one each or as noted in drawings) for review and approval prior to installing paper insert components. Vendor is responsible for all paper inserts on this project.
 3. If approved, one sample of each will be returned for installation and one sample will be retained by the Architect as a record copy.
 4. The Owner reserves the right to add to and otherwise modify sign text and lettering layout during the shop drawing review phase at no additional cost to the Owner. Room numbers are indicated in the Message Schedule. All room numbering shall be verified by Owner's Representative at Pre-Construction Meetings.
- H. Manufacturer's Installation Instructions: Submit on adhesive & tape.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain signs through one source from a single manufacturer.
- B. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years documented experience and sufficient production capacity to produce sign units required without causing delay in the Work.
- C. Installer: Company experienced in installing signage similar to that indicated for this Project with a minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All signage material shall be protected during fabrication, shipment, site storage and installation to prevent environmental damage or damage from other trades. Deliver signs in manufacturer's original boxes, properly labeled with corresponding sign message as the signs packed within. Store signs inside a well ventilated area and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.
- B. Division 1 - Product Requirements: Product storage and handling requirements.
- C. Store adhesive and attachment tape at ambient room temperatures.

1.7 PERFORMANCE REQUIREMENTS

- A. Sign finish shall comply with the following:
 - 1. Sign finish shall show no affect after repeated use of cleaners such as Graffiti Remove #1120 manufactured by Fine Organics Corp., Lodi, New Jersey.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Division 1 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install signs when ambient temperature is lower than recommended by manufacturer. Maintain this minimum temperature during and after installation of signs. Provide adequate ventilation per adhesive manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers of Panel Signs: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:
 - 1. Signs of Success, Santa Maria (805) 925-7545
 - 2. Freedom Signs, Santa Barbara, CA (800) 965.1410

3. Signs by Ken, Santa Barbara, CA (805) 966.7405
4. Karman Ltd., (818) 888.3818

2.2 MATERIALS

- A. Interior Panel Signs (Tactile and Non-Tactile): Provide either Acrylic or Photopolymer.
 1. Acrylic: Provide high-impact thermoplastic material composed of at least 85% by weight acrylonitrile units. Opaque color, non-glare matte finish.
 2. Photopolymer: Provide polymer resin abrasion resistant one-piece construction with all components integral to sign via photochemical resist. Factory applied baked-on-acrylic polyurethane enamel UV inhibited painted non-glare matte finish.
- B. Exterior Panel Signs (Tactile): Provide either photo-etched magnesium or zinc. Factory applied baked-on-acrylic polyurethane enamel UV inhibited painted non-glare matte finish.
- C. Exterior Panel Signs (Non-Tactile): Provide either magnesium or zinc. Factory applied baked-on-acrylic polyurethane enamel UV inhibited painted non-glare matte finish.
- D. Blank Acrylic backer panel: Provide a blank panel sign of same material, size and color for all signage installed on glass.
- E. Braille dots indicated on drawings must be domed or rounded.

2.3 PANEL SIGNS, GENERAL

- A. Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, attachment methods and details of construction. Comply with ADA Accessibility Guidelines (ADAAG) and CBC Sections 1115B.5 and 1117B.
 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally. Ease all edges and radius corners of signs. Saw marks, kerfs, rough or uneven edges are unacceptable. Edges shall be precision machined and visually smooth. All edges shall be painted with polyurethane paint; color as indicated in drawings.
 2. Size: As indicated on Drawings.
 3. Thickness:
 - a. Interior Panel Signs (Tactile and Non-Tactile): 1/4 inch thickness. Laminating panels together to achieve 1/4" thickness is not acceptable.
 - b. Exterior Panel Signs (Tactile and Non-Tactile): 1/8 inch thickness.
 4. Color: As selected by Architect from manufacturer's full selection range, unless otherwise indicated on drawings.

- B. Tactile and Braille Copy: Manufacturer's standard process for producing copy. Comply with the following:
1. Tactile Copy: Produce precisely formed characters, raised 1/32 inch minimum, with square, beveled, or rounded edges free from burrs and cut marks. 1/8 inch minimum between two closest points of adjacent tactile characters, measured from the top surface of the characters.
 2. Braille: Use rounded or domed California Braille dots per ANSI-117.1 703.5, integral to sign and same color as background, each distinct and separate. DOTS WITH STRAIGHT SIDES AND/OR FLAT TOPS WITH OR WITHOUT EASED EDGES ARE NOT READABLE FOR MANY BRAILLE USERS, AND ARE NOT ACCEPTABLE.
- C. Mounting Accessories:
1. Adhesives: Non-staining and non-sagging, high shear and tensile strength, Adhesive shall not embrittle, crack or lose flexibility with exposure to heat. Adhesives shall be used in conjunction with Black Foam Tape.
 - a. All sealants and adhesives to be field-applied, within the building envelope must comply with VOC limits in Division 01 Section "Indoor Air Quality (IAQ) Management".
 - b. Interior panel signs: Pressure sensitive adhesive or high grade industrial silicone adhesive as recommended by the adhesive manufacturer for the substrates shown.
 - c. Exterior panel signs: Heavy Duty exterior grade, moisture and humidity resistant adhesive as recommended by the adhesive manufacturer for the substrates shown.
 - 1) "OSI Sealants, Inc." PL 400 VOC
 - 2) "Simpson Strong-Tie Anchor Systems" Epoxy-Tie SET
 - 3) "Macco" Liquid Nails Ultra Duty Poly LN-950
 - 4) Or proven equal.
 2. Tape: 3M Scotch™ #4949 Black Acrylic Foam Tape (or proven equal), placed in 1/2" wide strips continuously around entire perimeter of panel.
 3. Blank Backer Panels: Same dimensions of sign; mount to second face of glass to conceal adhesive, etc.
- D. All graphic characters and symbols shall be painted. Applied Vinyl Die-cut characters or symbols created from vinyl film with pressure-sensitive adhesive backing are strictly prohibited. Any product submitted with Applied Vinyl Die-cut materials will be rejected and returned with-out review.
- E. Graphic Content and Style: Provide sign copy that complies with requirements indicated for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.

2.4 CODE REQUIREMENTS FOR PANEL SIGNS

- A. Finish and Contrast: Characters, symbols and their background shall have a nonglare finish. Characters and symbols shall contrast with their background, either light on a dark background or dark on a light background.
- B. Proportions: Raised characters on signs shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I." Stroke thickness of the uppercase letter "I" shall be 10 percent minimum and 20 percent maximum of the height of the character.
- C. Character Height: Raised characters shall be a minimum of 5/8 inches and a maximum of 2 inches high.
 - 1. Height from finish floor from baseline of character: 40 to ≤ 70 inches:
 - b. Horizontal viewing distance < 72 inches from finish floor: 5/8 inch minimum.
 - c. Horizontal viewing distance ≥ 72 inches: 5/8-inch plus 1/8 inch per foot of viewing distance above 72 inches.
 - 2. Height from finish floor from baseline of character > 70 to ≤ 120 inches:
 - d. Horizontal viewing distance < 180 inches from finish floor: 2 inches.
 - e. Horizontal viewing distance ≥ 180 inches from finish floor: 2-inches plus 1/8 inch per foot of viewing distance above 180 inches.
 - 3. Height from finish floor from baseline of character > 120 inches:
 - f. Horizontal viewing distance < 21 feet from finish floor: 3 inches.
 - g. Horizontal viewing distance ≥ 21 feet from finish floor: 3-inches plus 1/8 inch per foot of viewing distance above 21 feet.
- D. Raised Characters and Pictorial Symbol Signs: When raised characters are required or when pictorial symbols (pictograms) are used on such signs, they shall conform to the following requirements:
 - 1. Character Type. Characters on signs shall be raised 1/32 inch minimum and shall be sans serif uppercase characters accompanied by contracted (Grade 2) Braille complying with CBC Section 1117B.5.6.
 - 2. Character Size. Raised characters shall be a minimum of 5/8 inch and a maximum of 2 inches high.
 - 3. Pictorial Symbol Signs (Pictograms). Pictorial symbol signs (pictograms) shall be accompanied by the verbal description placed directly below the pictogram. The outside dimension of the pictogram field shall be a minimum of 6 inches in height.
 - 4. Character Placement. Characters and Braille shall be in a horizontal format. Braille shall be placed a minimum of 3/8 inch and a maximum of 1/2 inch directly below the tactile

characters; flush left or centered. When tactile text is multi-lined, all Braille shall be placed together below all lines of tactile text.

5. Proportions: Raised characters on signs shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I." Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.
- E. Braille: Contracted (Grade 2) Braille shall be used wherever Braille is required. Dots shall be 1/10 inch on center in each cell with 2/10-inch space between cells, measured from the second column of dots in the first cell to the first column of dots in the second cell. Dots shall be raised a minimum of 1/40 inch above the background. Braille dots shall be domed or rounded.
- F. Mounting Location and Height: Where permanent identification signs are provided for rooms and spaces, signs shall be installed on the wall adjacent to the latch side of the door. Where there is no wall space on the latch side, including at double leaf doors, signs shall be placed on the nearest adjacent wall, preferably on the right.
1. Where permanent identification signage is provided for rooms and spaces they shall be located on the approach side of the door as one enters the room or space. Signs that identify exits shall be located on the approach side of the door as one exits the room or space.
 2. Signs with raised characters and Braille shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest line of Braille and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters. Mounting location shall be determined so that a person may approach within 3 inches of signage without encountering protruding objects or standing within the swing of a door.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, measurements and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Notify Owner in writing of unacceptable substrates or detrimental conditions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means that installer accepts substrates and surfaces.
- C. Prior to installation, coordinate with Owner for removal of all wall mounted items which will interfere with signage installation.

3.2 INSTALLATION

- A. Prior to installation Contractor to arrange meeting with Architect at the site to inspect fabricated signs.

- B. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions. Provide adequate attachment adhesive materials. It shall be the sole responsibility of the Sign Contractor to provide adequate attachment adhesive materials. Use adhesive type recommended in writing by manufacturer to attach signs to irregular, porous, or vinyl covered surfaces. Any de-lamination or warping caused by the failure of mounting adhesives shall require repair and replacement of sign products at no expense to the Owner during the 'Guarantee to Repair Period' specified in the General Conditions.
1. All sealants and adhesives to be field-applied, within the building envelope must comply with VOC limits in Division 01 Section "Indoor Air Quality (IAQ) Management".
- C. Bond surfaces should be clean, structurally sound, dry, and free from all foreign materials which would adversely affect positive adhesion. Lightly sand bond areas of wall down to layer below paint prior to applying adhesive. Apply adhesive in a continuous bead and insure edges and center are adequately supplied to assure a complete and total bond.
- D. Install signs after doors and wall surfaces are finished, in locations indicated.
- E. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
- F. Interior and Exterior Panel signs shall be mounted to substrate with both black foam tape and adhesive, applied to back of sign. Drilling through signs or using exposed fasteners is not acceptable.

3.3 CLEANING AND PROTECTION

- A. After installation, clean and polish sign surfaces ensuring removal of all fingerprints, dirt, shavings, adhesive, dust particles, etc., according to the manufacturer's written instructions.
- B. Prior to leaving the installation location, clean the work area, walls, floor, etc., that may be soiled during the installation process. Protect units from damage until acceptance by the Owner.

3.4 SCHEDULES

- A. Text is provided for bidding purposes only; final verification will take place during submittal review.
- B. Message Schedule on Drawings:
1. Additional signs not listed here may be located throughout Project which are not associated with a door. See Drawings.

THIS SECTION CONTINUED ON THE FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College –Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Com. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 101423

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SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Conditions and Division 1 Specification Sections, apply to this Section.
- B. Painting
- C. Facility Fire Suppression

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fire Extinguisher Cabinets.
 - 2. Fire Extinguishers.
 - 3. Accessories.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 01 Specifications Sections.
- B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers".
 - 1. Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.5 COORDINATION

- A. Coordinate size of cabinets with type and capacity of fire extinguishers.

1.6 WARRANTY

- 1. Warranty Period: Materials and Workmanship: Six (6) years.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's operation and maintenance data under provisions of Division 1 Section "Closeout Procedures".
- B. Include test, refill or recharge schedules, procedures, and re-certification requirements including requirements applicable to the Work.

PART 2 – MATERIALS

2.1 MATERIALS GENERAL

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 MANUFACTURERS

- A. Where shown on the drawings, provide fire extinguishers, cabinets, accessories manufactured by Larsen's Manufacturing Co., 7421 Commerce lane N.E., Minneapolis, MN 55432 (763) 571 1181 or (800) 527-7367, Basis of Design, or approved equal from:
 - 1. J. L. Industries, Inc., a division of Activar Construction Products Group.
 - 2. Potter Roemer LLC.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Portable Hand Carried Fire Extinguishers:
 - 1. Multipurpose dry-chemical ABC type, steel container.
- C. Mounting Brackets: Steel with Identification lettering.

2.4 FIRE EXTINGUISHER CABINETS

- A. Cabinet Type: Larsen, Occult Series SS-0-2409
- B. Cabinet Construction: Non-rated.
- C. Cabinet Material: Stainless-steel sheet.

- D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated and fire extinguisher specified
 - 1. Decorative Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide ¾" recessed flange, of same material as box, attached to box to act as drywall bead.
- E. Door Material: 304 stainless-steel sheet.
- F. Door Style: Vertical duo door.
- G. Door Glazing: Tempered glass.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide concealed hinge, of same material and finish as trim, permitting door to open 180 degrees.
- I. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.
- J. Provide manufacturer's standard baked enamel white tub.
- K. Accessories:
 - 1. Mounting Brackets (If Any): Provide manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers, with plated or baked-enamel finish.
 - a. Provide brackets for extinguishers not in cabinets.
 - 2. Door Lock: Larsen-Loc.
 - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Die-cut lettering
 - 3) Lettering Color: Black on stainless steel; white on painted steel.
 - 4) Orientation: Vertical.
- L. Finishes:
 - 1. Door and exposed trim to be stainless steel with No. 4 finish. Interior box to be cold-rolled steel with standard matte black finish.

2.5 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
 - 3. Prepare doors and frames to receive locks
 - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 - 2. Fabricate door frames of one-piece construction with edges flanged.
 - 3. Miter and weld perimeter door frames.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. 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.

2.7 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Factory Prime Finish: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
- C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pre-treating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: Black / flat.

2.8 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.
- C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of ADA and governing authorities.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Protect against damage until Completion.

THIS SECTION CONTINUED ON FOLLOWING PAGE

Date: _____ Project Name: Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Comm. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 104400

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SECTION 115200 – AUDIO-VISUAL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following items:
 - 1. Mounts for LCD projectors.
 - 2. Mounts for flat panel TV's.
- B. Related Sections:
 - 1. Division 09 Section "Rough Carpentry" for stud blocking/backing.
 - 2. Division 09 Section "Acoustical Tile Ceilings".

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, bracket information, dimensions of individual components and profiles, and finishes.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: To include in maintenance manuals.
- B. Warranties: Sample of manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver or install front-projection screens until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Deliver all materials free from damage in original packages bearing manufacturer's label.
- C. Store all materials in such a manner as to protect them from corrosion, vandalism or damage in any form.

1.6 COORDINATION

- A. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, and fire-suppression system.

PART 2 - MATERIALS

2.1 PROJECTOR MOUNT

- A. Basis of Design: Provide products by Business Machine Security, www.LocDown.com, or approved equal.
 - 1. Drop Ceiling Plate: Model #DCP-ADJ 824 Adjustable Projector Mount Bracket Plate.
 - a. 16 gauge steel
 - b. Size: 8 by 24 inches.
 - c. Install above suspended acoustical tile with security cable and hanger wire support as shown on Drawings.
 - d. Maximum Load: 60 lbs.
 - 2. Ceiling Projector Mount: Model #LCD LOC II Universal Mount
 - a. Two interlocking steel trays to provide security and stability for LCD/DLP projectors.
 - b. Adjustment: $\pm 15\%$ tilt, pitch, roll and 360° swivel.
 - c. Maximum Load: 150 lbs.
 - d. Color: Grey (standard).
 - 3. Locking Mechanism: Provide high-security, pick resistant, five wafer, cylindrical screw type key lock at Drop Ceiling Plate and Project Mount.
 - a. Key alike.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and provide blocking in walls for proper and secure attachment of wall mounts.

3.2 INSTALLATION OF AUDIO-VISUAL EQUIPMENT, GENERAL

- A. Install in accordance with manufacturer's recommendations.
- B. Mounts are to be level and plumb.
- C. Touch up scratches on mounts or marks on ceiling and wall.

- D. Deliver mounting bolts or other loose accessories to the District in a clearly labeled carton for District's use in installing projector.

3.3 PROTECTION

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

THIS SECTION CONTINUED ON FOLLOWING PAGE

Date: _____ Project Name: Antelope Valley College – Palmdale Airport Terminal Remodel

WARRANTY FOR _____, in Agreement between Antelope Valley Comm. College District
(Specification Section) (Owner)

and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 115200

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements of Divisions 0 and 1 apply to work of this section.

1.2 RELATED SECTIONS

- A. This section applies to all sections of Division 22, except as may be otherwise modified in each section.

1.3 FEES, PERMITS AND PAYMENTS

- A. Fees, Permits and Payments: Contractor shall secure permits and inspections and pay full cost of same.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. Work designated on drawing or specifications to be installed or performed by other sections of the inspections.
- B. Finish painting: Equipment furnished shall be factory finished. If the factory finish is damaged during shipment, installation, etc., it shall be repainted by the Contractor subject to the Architect's approval.
- C. Electrical connections for motors, line voltage wiring and conduit and low voltage wiring and conduit.
- D. Individual motor controllers except when furnished as integral parts of packaged equipment.

1.5 EQUIPMENT RESTRICTIONS

- A. The proprietary name, and/or model indicated on the drawings, or the first listed for a category in the specifications is the make and/or model used as the basis for design. Bids shall be based on the use of the products of the selected manufacturers. Substitutions will be considered as outlined in General Conditions and Division 1; Section, "Substitutions." Other acceptable manufacturers are named in these specifications.
- B. Choice of Equipment: Equipment has been chosen, which will properly fit into the physical spaces provided and indicated, allowing ample room for access, serving, removal and replacement of parts, etc. Adequate space shall be allowed for clearance in accordance with

the code requirements and the requirements of the local inspection Department. Physical dimensions and arrangements of equipment to be installed shall be subject to the Owner's approval. Submit shop drawings of equipment layout for approval where equipment space does not comply with drawings. Changes in piping, motors, wiring, controls, structural or installation procedures required by the substituted product or equipment shall be made at no additional cost to the Owner, and with no reduction in scope.

C. Space Requirements:

1. In the preparation of drawings, a reasonable effort has been made to include equipment manufacturer's recommendations. Since space requirements and equipment arrangement vary according to manufacturer, the responsibility for initial access and proper fit rests with the Contractor. The final arrangement of the equipment and service connections shall allow the unit to be serviced. This shall include space to pull motors, filters, coils, tubes, etc. Make changes in piping and ductwork to suit actual installed equipment without further instructions or additional cost.
2. If the installation of the particular product or equipment, the Contractor has submitted, requires changes in material or size from that required in the contract drawings and specifications, such changes shall be submitted as shop drawings.
3. Contractor shall be aware that some equipment in the mechanical room must be in place before walls and/or roof is installed and shall schedule the installation of equipment accordingly.
4. Contractor shall pay the costs of design (3.0 x direct payroll) and installation of changes resulting from substitution of alternate products. Acceptance of alternate products by Architect does not change this requirement.

1.6 QUALITY ASSURANCE

A. Installer's Qualifications:

1. For the actual fabrication, installation, and testing of work, use only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturers' current recommended methods of installation.
2. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of the installers.

B. Certificates: Execute on behalf of the Owner and deliver to the Architect manufacturers' warranty certificates and instructions, etc. required to assure that the manufacturers' warranties are properly documented and in full effect for the warranty period.

1.7 CODES, ORDINANCES, REGULATIONS AND DEFINITIONS

A. Work and materials shall be in full accordance with the latest rules and regulations of the following Agencies and Codes, the Safety Orders of the Division of Industrial Safety; the California Mechanical Code; the California Plumbing Code; California Fire Code; the California

Building Code; California Energy Conservation Code; city ordinances and other applicable laws or regulations.

- B. Nothing in the drawings or specifications is to be constructed to permit work not conforming to these codes. Drawings and specifications shall take precedence when work and materials called for exceed code requirements.
- C. References to Code Specifications shall mean editions in effect at date of proposals.
- D. Reference to technical societies, trade organizations, governmental agencies are made in Mechanical Sections in accordance with the following abbreviations:

AABC	<i>Associated Air Balance Council National Standards for Field Measurement and Instrumentation, Total System Balance</i>
AGA	<i>American Gas Association</i>
AMCA	<i>Air Moving and Conditioning Association</i>
ANSI	<i>American National Standards Institute</i>
ARI	<i>Air Conditioning and Refrigeration Institute</i>
ASHRAE	<i>American Society of Heating, Refrigerating, and Air Conditioning Engineers</i>
ASTM	<i>American Society of Testing and Materials</i>
AWWA	<i>American Water Works Association</i>
CISPI	<i>Cast Iron Soil Pipe Institute</i>
ETL	<i>Electrical Testing Laboratory</i>
FM	<i>Factory Mutual</i>
IBC	<i>International Building Code</i>
ICC-ES	<i>International Code Council Evaluation Service</i>
IRI	<i>Industrial Risk Insurers</i>
ISO	<i>Insurance Service Organization</i>
NEBB	<i>National Environmental Balancing Bureau Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems</i>
NEC	<i>National Electrical Code</i>
NFC	<i>National Fire Codes</i>
NFPA	<i>National Fire Protection Association</i>

NRCA	<i>National Roofing Contractor's Association</i>
OSHPD	<i>Office of Statewide Health Planning and Development for the State of California</i>
PDI	<i>Plumbing and Drainage Institute</i>
SMACNA	<i>Sheet Metal and Air Conditioning</i>
UL	<i>Underwriter's Laboratories, Inc.</i>

E. Definitions:

APPROVED	<i>As approved by Owner's Representative.</i>
ARCHITECT / ENGINEER	<i>The Architect or Engineer of record for this project. The Architect or Engineer is the Owner's representative regarding preparation, revisions and interpretation of the contract documents.</i>
AS DIRECTED	<i>As directed by the Owner's Representative.</i>
AS REQUIRED	<i>As required by applicable Code requirements; by good business practice; by the conditions prevailing; by the Contract Documents; by Owner, or by Owner's Representative.</i>
AS SELECTED	<i>As selected by Owner's Representative.</i>
BATTERY	<i>Two or more fixtures served from same branch.</i>
BY OTHERS	<i>Work on this Project that is outside the Scope of Work to be performed by the Contractor under this Contract, but that will be performed by Owner, other Contractors or other means.</i>
CERTIFIED TEST REPORTS	<i>Test Reports signed by an authorized official stating that tests were performed in accordance with the test method specified that the results reported are accurate, and that items tested either meet or fail to meet the stated minimum requirements.</i>
CERTIFIED INSPECTION REPORTS	<i>Reports signed by approved Inspectors attesting that the items inspected meet the Specification requirements other than any exceptions included in the report.</i>
CONCEALED	<i>Embedded in masonry, concrete or other</i>

construction, installed within furred spaces, or in enclosures.

EQUAL

The Contract documents are based upon the manufacturer and model number indicated on the drawings or specifications. Bidder may propose alternative product but will be considered only if the bidder has submitted a base Bid, which is in accordance with the specified product. Alternate proposal shall include complete technical data and itemized price adjustments. Bidder shall assume the responsibility that the alternate product meets the physical, mechanical, electrical, structural, acoustical and architectural requirements of the specified product. Acceptance of an alternate product does not entitle the Contractor to a Change Order to modify architectural, structural, mechanical, electrical, control or any other systems necessary to accommodate the alternate product. The Owner or his representative may reject alternate products.

EXPOSED

Not installed underground or not concealed as defined above.

FIELD TESTS

Tests or analysis made at, or in the vicinity of the job site in connection with the actual construction.

FURNISH

Supply and deliver to the Project site only, not install (unless required to be installed elsewhere in the Contract Documents). Product must be delivered ready for installation and in operable condition.

INSTALL

Install (services or labor) only, not furnish (unless required to be furnished elsewhere in the Contract Documents). Install means to place in final position, complete, anchored, connected and ready to operate.

LIFE SAFETY SYSTEMS

Systems involved with fire protection: including sprinkler piping, fire pumps, jockey pumps, fire pump control panels, service water supply piping, fire dampers, and smoke exhaust.

Systems involved with and/or connected to emergency power supply: including generators, transfer switches, transformers, and circuits to fire protection, smoke evacuation, and emergency

	<i>lighting systems.</i>
	<i>Medical and life support systems.</i>
	<i>Fresh air and relief systems on emergency smoke control sequence.</i>
MAIN	<i>The principal artery of a system of continuous piping or ductwork, to which branches may be connected.</i>
MANUFACTURER'S DIRECTIONS, INSTRUCTIONS, RECOMMENDATIONS, SPECIFICATIONS	<i>Manufacturer's written directions, instructions, recommendations, specifications.</i>
PRODUCT	<i>Materials, systems, equipment and fixtures.</i>
MANUFACTURER'S CERTIFICATE CONFORMANCE	<i>A certificate signed by an authorized manufacturer's official attesting that the material or equipment delivered meets the specification requirements. Manufacturer's representative certificate is not acceptable.</i>
MUST; SHALL; TO; WILL	<i>When used as a directive to the Contractor, these items indicate a mandatory action.</i>
NECESSARY	<i>Essential to completion of work.</i>
OWNER-FURNISHED, CONTRACTOR-INSTALLED	<i>To be furnished by the Owner at its cost and installed by the Contractor as part of the work.</i>
PROVIDE	<i>Shall include "Furnish and install" which means supply, fabricate, deliver, place and connect, complete in place, ready for operational use. When neither furnish, install or provide is stated, "provide" is implied.</i>
REMOVE	<i>To remove item completely including attachments, frames, anchors, fittings, bases, pipes, conduits and supports, capping behind finished surfaces and repairing floors, bases and walls to match color and texture and be smooth with existing adjacent surfaces.</i>
RISER	<i>A vertical waterline supplying two or more fixtures, or batteries of fixtures located in different rooms.</i>

SHOWN	<i>As indicated on the Drawings.</i>
SPECIFIED	<i>As written in the Contract Documents.</i>
SUBMIT	<i>Submit to Owner's Representative.</i>
TESTING LABORATORY	<i>A person or organization whose functions include testing, analyzing or inspecting products and/or evaluating the designs or specifications of such products according to the requirements of applicable standards.</i>
WORK	<i>Work of the Contractor or Subcontractor includes labor or materials (including, without limitation, without equipment and appliance) or both, incorporated in, or to be incorporated in the construction covered by the complete Contract.</i>

1.8 SEISMIC RESTRAINT

- A. Design, furnish, and install attachment devices, anchor bolts, and seismic restraints that are required for seismic compliance for all equipment, apparatus, piping, conduit and raceways, ductwork, and other components of the specified systems required by reference codes and standards.
- B. Provide seismic restraint types as described. If the item to be restrained is not listed, select appropriate restraint and submit for approval.
- C. Provide seismic bracing for mechanical, plumbing, and fire protection systems.
- D. Seismic Restraints Requirements
 1. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:
 2. Ability to accommodate relative seismic displacements of supported item between points of support.
 3. Ability to accommodate the required seismic forces.
 4. For each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces.
 5. For each weld between structure and item subject to seismic force, provide calculations to verify adequacy.
 6. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.

1.9 SUBMITTALS

- A. General: Refer to Division 1.
- B. Project Drawings:
 - 1. The drawings are diagrammatic and indicate the general layout of the equipment.
 - 2. The exact location shall be field determined, after shop drawing review for the installation in available space at the job site.
- C. Equipment Lists and Equipment Brochures and Shop Drawings.
 - 1. Copies: Submit six copies of data as specified hereafter.
 - 2. Items of material and equipment required by this Division shall be reviewed by the Architect prior to the start of work. The Contractor shall submit items requiring such review, allowing ample time for the checking and processing, and shall assume responsibility for delays incurred due to the rejected items. Rejected items shall be resubmitted as specified only. Submittal information covering items shall be neatly bound together into booklets, each booklet containing individual items specified. Separate submittals of individual items are not allowed. Each submittal item shall be identified with the governing specification section, paragraph, subparagraph, or reference drawings, as applicable.
 - 3. Equipment Lists: Provide name of manufacturer, brand name, and catalog number of each item. Submit complete submittals, at one time, having items arranged in numerical sequence with each item identified by section and article of the specifications. Listing items "as specified" without both name and model or type designation is not acceptable, except pipe and fitting not specified by brand names may be listed "as specified" without manufacturer's name, provided proposed materials comply with specification requirements.
 - 4. Material Brochures: Provide copies of complete description, information and performance data covering materials and equipment, which are specified. Brochures submitted to the Architect shall be published by the manufacturers and shall contain complete and detailed engineering and dimensional information. Brochures not compiled in the following manner shall be returned for re-submittal. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall not submit catalogs, which describe several different items other than those items to be used unless all irrelevant information is marked out, or unless relevant information is clearly marked. Brochures from each manufacturer shall be identified.
 - 5. Shop Drawings:
 - a. Refer to Divisions 0 and 1.
 - b. Provide additional data as specified in Governing Specification Section.
 - 6. Seismic Restraint
 - a. Shop Drawings
 - 1) Where walls and slabs are used as seismic restraint locations, provide details of acceptable methods for restraint of equipment, ducts, conduit and pipe shall be included, with supporting certified calculations.

- 2) Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
 - 3) A copy of the coordination or contract drawings shall be marked-up with the specific locations and types of restraints shown for pipe, duct, and equipment. Rod bracing and assigned load at each restraint location shall be clearly delineated. Each drawing shall be signed by the same engineer performing the seismic calculations noted below.
 - 4) For ceiling suspended equipment, provide minimum and maximum installation angle allowed for restraint system, as well as braced and un-braced rod lengths at each allowable installation condition.
- b. Seismic Certification and Analysis
- 1) Seismic restraint calculations shall be provided for connections of equipment to the structure. Performance of products (such as: strut, cable, anchors, clips, etc.) associated with restraints shall be supported with manufacturer's data sheets or certified calculations. Seismic calculation shall be certified by a Professional Structural or Civil Engineer registered in the State of the project.
 - 2) Seismic restraint calculations shall be based on the acceleration criteria required by local codes. Note: For roof-mounted equipment, both the seismic acceleration and wind loads shall be calculated; the highest load shall be utilized for the design of the restraints and isolators.
 - 3) Calculations to support seismic restraints designs shall be stamped by a professional engineer who is registered in the state where the work is being performed, with at least five years of seismic design experience.
 - 4) Table elevations refer to the structural point of attachment of the equipment support system (i.e., use floor slab for floor supported equipment and the elevation of the slab above for suspended equipment).
 - 5) Analysis shall indicate calculated dead loads, derived loads, and materials utilized for connections to equipment and structure. Analysis shall detail anchoring methods, bolt diameter, embedment and/or weld length.
- c. Product Data: For the following:
- 1) Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2) Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a) Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by OSHPD or an agency acceptable to authorities having jurisdiction.
 - b) Annotate to indicate application of each product submitted and compliance with requirements.
 - 3) Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
- d. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including

analysis data signed and sealed by the qualified professional engineer with at least five years of seismic design experience responsible for their preparation.

- 1) Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic and wind forces required to select vibration isolators, seismic and wind restraints, and for designing vibration isolation bases.
 - a) Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Division 15 Sections for equipment mounted outdoors.
 - 2) Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
 - 3) Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
 - 4) Seismic-Restraint Details:
 - 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 the restrained items and to the structure. Show attachment locations, methods, and spacing. 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.
 - c) Coordinate seismic-restraint and vibration isolation details with wind restraint details required for equipment mounted outdoors. Comply with requirements in other Division 22 Sections for equipment mounted outdoors.
 - d) Preapproval and Evaluation Documentation: By OSHPD or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
 - e. Coordination Drawings: Show coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.
 - f. Welding certificates.
 - g. Qualification Data: For professional engineer and testing agency.
 - h. Field quality-control test reports.
7. Miscellaneous: Prior to installation, submit to Construction Supervisor on the job site, two copies of the following:
- a. Shop Drawings of equipment layouts
 - b. Installation instructions for each piece of mechanical equipment furnished.
 - c. Dimension drawings for mechanical equipment pads and curbs including bolt sizes and locations.

8. Submittals required by these specifications, include drawings, calculations, brochures, samples, etc. shall be submitted as one package. Partial submittals will be returned unprocessed.

D. Record Drawings and Operating and Maintenance Books

1. Record Drawings (Refer to Division 1): On completion of work, furnish the Owner through the Architect, with a complete set electronic record drawings and shop drawings which properly reflect the locations of all equipment, fixtures, piping, ductwork, diffusers, mixing boxes, controls, etc., as actually installed. Where necessary to locate concealed equipment, dimensions, shall be included on these drawings. Maintain a separate set of drawing prints at the job site for such marking of "As-Built" locations. This set shall be updated as the installation work progresses and shall be available to the Architect at job visits. The Contractor shall indicate on the "As-Built" Drawings all deletions in green. Additions, relocations, rerouting and modifications shall be indicated in red.
2. The format shall be AutoCad 2016 or later. A CD with the electronic model will be supplied to the successful bidder for this purpose. Monthly changes shall be made to the drawings on a layer named "record" and the color shall be green. A copy of the model on CD with any "as-built" changes shall be submitted to the Architect along with all payment applications.
3. At the end of the project, the Contractor shall take "as-built" drawings modifying the electronic drawing files to show all changes, modification or additions made during construction. These drawings will become "Record Drawings" to be delivered to the Architect.
4. Final Record Drawings shall include legends, schedules, plans, sections and details.
5. Record Drawings shall be marked on the lower right corner with the following:
 - a. Name of Contractor
 - b. Record Drawings
 - c. Date
 - d. Building Permit Number
 - e. Letter shall be bold and print 1/4 inches high minimum.
6. Contractor shall submit to the Architect, Record Drawings as follows:
 - a. Four CDs (AutoCad 2014 or later)
 - b. One reproducible set of drawings
 - c. Four sets of drawings
7. The Architect will distribute the final Record Drawings as follows:

	OWNER	ARCHITECT	ENGINEER
CDs	1	1	1
Reproducible drawing set	1	0	0
Drawing Sets	1	1	1

8. Delivery of complete set of Record Drawings is one condition for the release of Contractor's final payment under the Contract.

E. Operating and Maintenance Books

1. Operating and Maintenance Books (Refer to Division 1): Provide the Owner through the Architect, operating instructions and maintenance data books for all equipment and materials furnished under this Division.
2. Submit five copies of operating and maintenance data books to the Architect for review two weeks before final inspection of the project. Assemble data in a single complete indexed volume and identify the size, model and features indicated for each item, as follows:
 - a. Identification readable from the outside of the cover, stating "Heating, Ventilating and Air Conditioning and/or Plumbing and/or Fire Protection Installation. Owner, by (name of company)."
 - b. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of emergency data regarding the installation.
 - c. Complete instructions regarding the operation and maintenance of all equipment involved.
 - d. Complete nomenclature of replaceable parts, their part numbers, current cost and name and address of the nearest vendor of replacement parts.
 - e. Valve identification table keyed to valve I.D. number (e.g. V-1) on brass tag attached to each valve. Table shall indicate type of valve, product or service (e.g. domestic cold water), and function (e.g. shut-off, balancing, etc.).
 - f. Copy of guarantees and warranties issued on the installation showing dates of expiration.

1.10 EXPLANATION AND PRECEDENCE OF DRAWINGS

- A. For purpose of clearness and legibility, the drawings are essentially diagrammatic although size and location of equipment is drawn to scale wherever possible. The Contractor shall make use of data in contract documents and shall verify this information at building site.
- B. Attention is called to the inclusion of flow diagrams, riser diagrams and details. Diagrams are not for the purpose of giving physical dimensions or locations, but rather to clarify sizes and the interconnections of the piping and of the various units of the process.
- C. Other drawings of the contract set are hereby made a part of these specifications and shall be consulted by the Contractor and his work adjusted to meet the installation conditions.
- D. Drawings indicate required size and termination of pipes and ducts and suggest proper routes of piping and duct to conform to the structure, to avoid obstructions and to preserve clearance. However, it is not the intention to indicate necessary offsets and it shall be the responsibility of the Contractor, under this section, to install ductwork and piping in such a manner as to conform to structure, avoid obstructions, preserve headroom, keeping openings and passageways clear, and make equipment requiring inspection, maintenance and repair accessible without further instructions or extra cost to the Owner.

- E. Changes in location on piping, apparatus and equipment as indicated on the drawings shall be made to meet the architectural and structural conditions as required and acceptable to the Architect. Changes in work which has not been installed shall be made by Contractor without additional compensation, except changes which are caused by architectural and structural changes which increase the lengths of pipe or duct runs.
- F. Contractor shall coordinate with other trades so that no interferences shall occur, as no extras will be allowed for changes made necessary by interferences with the work between trades.
- G. CAD files plots and reproductions for this project are the property and instruments of service of d'Autremont-Helms & Associates, (dHA). dHA reserves and retains copyright authority, privileges and rights.
 - 1. Upon request and subject to some limitations dHA with their client's approval, may allow contractors and/or vendors to acquire and use copies of the electronic media file data for preparation of:
 - a. Fabrication of shop drawings for this project.
 - b. Submittals pertaining to this project.
 - c. Record documents.
 - 2. Applicable limitations include:
 - a. The Contractor or vendor acquiring these files agrees to hold harmless dHA the Architect and Owner from liability and/or damages resulting from their use.
 - b. The Contractor or vendor acquiring these data files assumes full responsibility for their use and for the correctness of any information or features contained therein.
 - c. dHA does not warranty, (explicit or implied) the accuracy of the building backgrounds, or dimensions or features contained therein.
 - d. Usage is limited to this specific project and the specific acquirer.
 - e. The files are released solely for the convenience of the contractor or vendor acquiring same and CAD files may not be transferred to third parties without written prior approval.
 - f. dHA shall remove seals, proprietary identification, etc.

1.11 COMPLETE PERFORMANCE OF WORK

- A. Practices of the Trades: Work shall be executed in strict accordance with the best practice of the trades by competent workmen.
- B. Complete Functioning of Work: Labor, materials, apparatus, and appliances essential to the complete functioning of the systems described and/or indicated, or which may be reasonably implied as essential, whether mentioned in these contract documents or not, shall be furnished and installed by the Contractor. In cases of doubt as to the work intended, or in the event of need for explanation thereof, the Contractor shall call upon the Architect for supplemental instructions.

- C. Work not shown in complete details shall be installed in conformance with accepted standard practice.

1.12 CONTROL AND OBSERVATION

- A. The Architect and Owner shall have the right to reject materials or workmanship, which in their opinion are not in accordance with this contract, to interpret contract provisions and the meaning of the drawings and specifications. The above named parties shall be allowed access to the work for observation at all times.
- B. Defective work or work contrary to the contract documents may be rejected without regard to state of completion, even though said work has been accepted as a result of a previous observation.

1.13 APROVALS

- A. Electrical equipment shall meet the listing requirements and bear a minimum of one of the following agency labels:
 - 1. Underwriter's Laboratories (UL)
 - 2. Electrical Testing Laboratories (ETL)
- B. No equipment will be accepted on the jobsite without prior written approval.

1.14 GUARANTEES

- A. In addition to specific guarantees mentioned in these specifications, the Contractor shall leave the entire installation in complete working order and free from defects in materials, workmanship or finish. Contractor shall repair or replace at his own expense work or parts of work that may develop defects due to faulty material or workmanship during the tests and within a period of one year after the work is accepted by the Owner. Contractor shall guarantee also to repair or replace with like materials existing work of the building or equipment, which is damaged during the repairing of such defective apparatus, materials or workmanship. The signing of the contract for his work covered by these specifications and of which they shall become a part, shall become a written guarantee on the part of the Contractor to carry out the provisions of this section of these specifications.

1.15 SEISMIC RESTRAINT QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the CBC unless requirements in this Section are more stringent.

- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer with at least five years of seismic design experience.

1.16 DAMAGE BY LEAKS

- A. During the time period from the date of contract until termination date of this guarantee, the Contractor shall be responsible for damages to the ground, walls, roads, building, piping systems, electrical systems, heating, ventilating and air conditioning systems, building equipment, furniture and other building contents caused by leaks in the piping systems or equipment being installed or having been installed by him. Repair work shall be done as directed by, in a manner satisfactory to the Owner at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Standard of Quality: Materials and equipment shall be new and in good condition. The commercially standard items of equipment and the specific names mentioned in sections of Division 22 are intended to establish the standards of quality and performance necessary for the proper functioning of the mechanical work.
- B. Variations: Since manufacturing methods vary, reasonable minor equipment variations are expected; however, performance and material requirements are minimum. The Architect retains the right to judge equality of equipment that deviates from the specifications.
- C. Symbols are for identification. Symbols, capacities, sizes, and electrical characteristics are indicated on the drawings. Contractor shall make necessary provisions for installation of his equipment and for attaching or connecting his work to other trades.

2.2 FLASHINGS

- A. Make pipes and vents passing through roof or outside wall waterproof with flashings and storm collars or counter flashings.

- B. Except as otherwise noted or required, extend vent pipes passing through roof at least 12 inches above finished roofline.
- C. Furnish and install on each pipe passing through the roof a galvanized sheet metal flashing assembly with eight-inch skirt.
- D. Furnish and install on each pipe passing through the roof a six-pound seamless lead flashing assembly with eight-inch skirt. Flashing shall have steel reinforced conical boot and be complete with open top cast iron counter flashing and permaseal waterproofing compound. For sanitary vent, provide a hood with a minimum 2 to 1 free area to vent pipe size.

2.3 PIPE SLEEVES

- A. Provide pipe sleeves for mechanical piping.
- B. Size pipe sleeves to permit placing pipe and specified isolation material for pipes passing through concrete or masonry walls or concrete slabs.
- C. Sleeve for pipes through floor slabs standard weight black steel pipe with top of sleeve projecting 3" above finished floor. For waterproof sleeves, use J.R. Smith Fig. 172 or equivalent by Zurn or Josam.
- D. Sleeves for pipes through walls shall standard weight black steel Schedule 40 pipe with ends flush with wall surfaces.
- E. Seal pipes passing through fire rated walls or roofs. Use Dow Corning 3-6548 Silicone RTV Foam in the annular space between pipes and sleeves. Sealant through fire rated walls or roofs shall be rated with the same fire rating as the wall or roof.
- F. Insulated pipe shall be insulated in sleeves, caulked and sealed as above. Use type CS-CW inserts as manufactured by Pipe Shields, Inc.
- G. Pipes passing through exterior walls and concrete walls shall be sealed watertight with "Linkseal" as manufactured by Thunderline Corp. Method of installation as recommended by the manufacturer.

2.4 PIPE ISOLATORS AND COVERING PROTECTION

- A. Pipe isolators: Provide each hanger or clamp for un-insulated piping with an isolation material, having metal backing, to isolate sound vibration and electrolysis. Provide Elcen "Isolator or appeared equal." Isolator not required for fire protection automatic sprinkler piping, waste, vent and natural gas piping.

2.5 ELECTRIC MOTORS

- A. Horizontal mounted fan and pump motors (close coupled excepted) shall be of the “Premium” efficiency type. Provide General Electric “Energy Saver,” Westinghouse “Tee 11”, U.S. Motors,”XB”, Baldor “Super E”, “Lincoln” “Ultimate EI” motors or approved equal unless otherwise specified. Guaranteed minimum full load efficiencies shall be certified in accordance with Institute of Electrical and Electronic Engineers (IEEE) Standard 112 Test Method B, National Electric Manufacturers’ Association (NEMA) MG-1-12.53a, and shall meet or exceed the following minimum criteria:

GUARANTEED MINIMUM FULL-LOAD NOMINAL EFFICIENCY						
MOTOR HORSEPOWER	OPEN MOTORS			ENCLOSED MOTORS		
	1,200 rpm	1,800 rpm	3,600 rpm	1,200 rpm	1,800 rpm	3,600 rpm
1	80.0	82.5	--	80.0	82.5	75.5
1.5	84.0	84.0	82.5	85.5	84.0	82.5
2	85.5	84.0	84.0	86.5	84.0	84.0
3	86.5	86.5	84.0	87.5	87.5	85.5
5	87.5	87.5	87.5	87.5	87.5	87.5
7.5	88.5	88.5	87.5	89.5	89.5	88.5
10	90.2	89.5	88.5	89.5	89.5	89.5
15	90.2	91.0	89.5	90.2	91.0	90.2
20	91.0	91.0	90.2	90.2	91.0	90.2
25	91.7	91.7	91.0	91.7	92.4	91.0
30	92.4	92.4	91.0	91.7	92.4	91.0
40	93.0	93.0	91.7	93.0	93.0	91.7
50	93.0	93.0	92.4	93.0	93.0	92.4

1. 1/2 HP and Larger: 208 Volt 3 phase, 60 Hertz
2. Smaller than 1/2 HP: 115 Volt, 1 phase, 60 Hertz.

B. General:

1. Motors shall be started across the line unless otherwise specified. Motors shall be selected with low starting current and shall be designed for continuous duty to provide the running torque and pull-in-torque required to suit the load. Unless otherwise specified, motors shall be single speed –1750 rpm.
2. Motors shall have standard drip-proof enclosure unless otherwise specified.
3. Motors exposed to weather shall be of the totally enclosed fan-cooled type.

4. Motors shall have at least 1.15 service factor. Motors shall be selected to operate at design conditions without exceeding nameplate ratings without operating using the service factor.
 5. Motors shall be sealed or field-lubricated in which case the latter shall be provided with grease fittings.
 6. Pump motors shall be selected to drive the pump through its characteristic curve, from zero to 25% above the design flow, without exceeding rated full load nameplate horsepower. Pump motor nameplate rating shall not be exceeded in pump operation anywhere in the pump curve.
- C. Three-Phase: Three-phase motors 10 horsepower and smaller shall have cast iron or steel housings and shall be of the squirrel cage induction type. Three-phase motors 15 horsepower and larger shall have cast iron housings and shall be of the squirrel cage induction type.
 - D. Single Phase: Single phase motors shall be capacitor-start type having internal thermal overload protection and with starting, pull-in and running characteristics to suit the load.
 - E. Where motor is an integral part of equipment, motor manufacturer shall be as recommended by the equipment manufacturer. However, other items shall comply with these specifications.
 - F. Nameplate: A motor nameplate shall be securely affixed to each motor and shall clearly indicate the class of insulation and the service factor in addition to the usual electrical data.
 - G. Special Requirements: Refer to various sections of this Division for special requirement for specific items of equipment requiring motors.
 - H. Submittals: Manufacturer's data for equipment requiring motors shall be submitted for review. Indicate the motor manufacturer, motor horsepower, voltage, speed, efficiency, special torque requirements, enclosure and other special requirements.

2.6 ESCUTCHEONS

- A. Provide heavy chrome-plated or nickel plated plates or approved pattern on pipe passing through floors, walls and ceilings in finished areas. Escutcheons shall be chrome-plated steel plates with concealed hinges and setscrew. Pattern shall be approved by the Architect.

2.7 CORROSION PROTECTION

- A. Prior to delivery to the job site, wrap buried steel pipe with corrosion protective wrap of pressure sensitive polyvinyl chloride or polyethylene tape applied after pipe has been thoroughly cleaned. Tape shall be nominal thickness of 20-mil consisting of one layer of 20-mil tape or two separate layers of 10-mil tape. Apply with suitable primer adhesive recommended by manufacturer.

- B. Tightly apply tapes with 1/2-inch minimum uniform lap, free from wrinkles and voids. Use approved wrapping machines and experienced operators.
- C. Tapes: "Chasekote" No. 775, Plicoflex No. 340-25, Polyker 922 and 923, "Scotchwrap" No. 51 or equal. Apply tape after pipe is cleaned as recommended by the tape manufacturer.
- D. Cover filed joints and fittings by wrapping polyethylene or polyvinyl tape specified for wrapping piping, except use two layers of 10-mil thick tape. Wrap joints to provide minimum of six-inches over adjacent pipe covering. Where fittings are wrapped, width of tape shall not exceed two inches. Apply adequate tension so tape will conform tightly to contours of fittings. Use putty tape insulation compounds such as "Scotchfil" or equal to fill voids and provide smooth even surface for application of tape wrap.
- E. Alternate: In lieu of tape wrap, factory applied plastic coating on steel pipe will be acceptable. Use tapes for field joints, fittings and valves same as specified above. Pipe Coating: "X-Tru Coat" (20-mil thick) as manufactured by Standard Pipe Protection, Republic, Pipe Line Service Corp., Scotchkote 202 (12-mil thick) as manufactured by 3M Company, or equal, with "X-Tru-Tape", or equal, for joints and valves.
- F. Test wrapped or coated pipe, fittings and field joints on job site, after assembly, with approved high voltage holiday detector Tinker and Rasor, or equal, with positive signaling device to indicate any flaws, holes or breaks in wrapping. Set peak voltage to 10,000-Volt. If Scotchkote 202 is used, set peak voltage to 1,000-Volt. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Architect.
- G. No special precautions are required for copper or plastic piping below grade.
- H. Special wrapping is required for contact with concrete such as thrust blocks or floor slabs. Piping shall be wrapped with minimum 8-mil thick polyethylene plastic sheets.

2.8 ACCESS COVERS AND ACCESS DOORS

- A. Access covers and doors locations shall coordinate with Architect.
- B. Provide access covers over under floor buried mechanical valves, controls, clean outs, located in interior and exterior floor and grade areas.
- C. Provide access door over concealed mechanical valves, controls, duct coils, dampers, fire dampers, pipe chases, concealed mechanical equipment through fire rated walls and ceilings.
- D. Provide access doors for access to mechanical equipment valves.
- E. Provide rated access covers or doors when required by the ceiling and wall fire rating.
- F. Access covers – Interior concrete floors:

1. Type: Square or rectangular frame with hinged and secured cover.
 2. Size: Nominal 10 x 10-inch.
 3. Construction: Aluminum alloy frame and hinged score rated XH cover with lifting device. Secure with vandal proof screws.
 4. Marking: Cast cover with words "CLEANOUT", "GAS SHUT-OFF" or "WATER SHUT-OFF" when used for these services.
 5. Acceptable manufacturers: Smith No. 4915, Zurn, Josam.
- G. Access Covers – Interior vinyl floors:
1. Type: Square or rectangular frame with recessed cover.
 2. Size: Nominal 10 x 10-inch.
 3. Construction: Aluminum alloy frame and tile recess XH cover with lifting device. Secure with vandal proof screws at each corner.
 4. Acceptable manufacturers: Smith No. 4920, Zurn, Josam.
- H. Access Doors – Walls and ceilings:
1. Type: Flush or recessed panel.
 2. Size: Minimum 12 x 12-inch nominal door for hand access, minimum 16 x 20-inch nominal door for personal access.
 3. Location and style:

Masonry/concrete walls	Milcor "M" Standard
Gypsum wallboard walls and ceilings	Milcor "M" Standard
Plastered surfaces (except toilet walls)	Milcor "K" Standard
Tile/terrazzo/toilet room walls (with casing bead stainless)	Milcor "M" Standard
Acoustical tile (check type of ceiling system)	Milcor "A"
General areas	Milcor "M" Standard
Fire rated shafts, rated walls and ceilings	Milcor "B" Standard
 4. Material:
 - a. Stainless Steel, No. 302 with No. 4 finish.
 - b. Standard manufacturer's standard construction and finish for type specified.
 5. Locking:
 - a. Screwdriver: Flush screwdriver operated with case hardened cam.
 6. Acceptable Manufacturers Milcor, Zurn, Miami, Carey, Potter-Roemer.

2.9 SEISMIC-RESTRAINT DEVICES

- A. Basis-of-Design Product and Systems: Subject to compliance with requirements, provide Mason Industries or a comparable product by one of the following:
1. Kinetics Noise Control

2. Loos & Co.; Cableware Division
 3. Mason Industries
 4. TOLCO Incorporated; a brand of NIBCO INC.
- B. Provide seismic restraints and seismic bracing equipment and systems as described in Part 3 and the Mason Industries Seismic Restraint Guidelines for acceptable restraint methods and OSHPD approved details.
- C. Seismic Restraint Types
1. Type I: Restrained Spring Mount, Mason SLR-A. Isolator shall incorporate snubbing restraint in all directions, and be capable of supporting equipment at fixed elevations during installation.
 2. Type II: Resilient Seismic Snubber. Mason Z-1011. Each corner or side of equipment base shall incorporate a seismic restraint having a minimum of 5/8-inch thick, all directional resilient pad limit stop. Restraints shall be fabricated of plate, structural members or square metal tubing. Angle bumpers are not acceptable.
 3. Type III: Cable or Brace Restraint. Mason SCB and SSB. Multiple metal cable or steel strut type with approved fastening devices to equipment and structure. System to be field bolted to deck or overhead structural members using two sided beam clamps or appropriately designed inserts for concrete.
 4. Type IV: Spring Neoprent Hanger. Mason 30N. Double deflection neoprene isolator min. 0.15-inch encased in ductile iron or steel casing.
 5. Type V: Non-isolated equipment shall be field bolted or welded (powder shots not acceptable) to the structures as required to meet seismic forces. Bolt diameter, imbedment data, and/or weld length must be shown in certified calculations as noted above.
- D. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by OSHPD or an agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- E. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
 2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
 3. Maximum 1/4-inch air gap, and minimum 1/4-inch thick resilient cushion.
- F. Channel Support System: Fabricated support assembly made of slotted steel channels with 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; and rated in tension, compression, and torsion forces.
- G. Restraint Cables: ASTM A 603 galvanized or ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
 - H. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod.
 - I. 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.
 - J. 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.
 - K. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water resistant neoprene, with a flat washer face.
 - L. Mechanical Anchor Bolts: 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 required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
 - M. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl 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 E 488.
 - N. Factory Finishes
 - 1. Finish: Manufacturer's standard prime-coat finish ready for field painting.
 - 2. Finish: Manufacturer's standard paint applied to factory-assembled and - tested equipment before shipping.
 - a. Powder coating on springs and housings.
 - b. Hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
 - c. Baked enamel or powder coat for metal components on isolators for interior use.
 - d. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 SUPERVISION

- A. The Contractor shall furnish the services of a Superintendent experienced in the work of each section who shall be constantly in charge of the progress of the work, together with all the necessary journeymen, helpers and laborers required to properly unload, erect, connect, adjust, start, operate and test the work involved.

3.2 PROTECTION, CARE AND CLEANING

- A. The premises shall be maintained as required by Division 1.
- B. Materials and Equipment:
 - 1. Effectively protect materials and equipment to be installed on a project against moisture, dirt and damage during the construction period, to the entire satisfaction of the Owner. Special care shall be taken to provide protective and similar equipment that are particularly vulnerable to grit and dirt.
 - 2. Keep interior of ductwork free of dirt, grit, dust, installation and other foreign materials. Do not operate air distribution equipment until building is cleaned and air filters installed in order to prevent soiling of diffusers, ducts, air handling equipment, and buildings. Provide new set of filters after final acceptance of air distribution systems.
 - 3. Drain and flush piping to remove grease and foreign matter. Thoroughly clean out valves, traps, strainers, and demonstrate the cleanliness to the Owner.

3.3 DISPOSITION OF MATERIALS

- A. Refer to Divisions 1 and 2.

3.4 CLEAN-UP

- A. Debris and Rubbish: Remove and transport debris and rubbish in a manner that will prevent spillage on pavement, streets, or adjacent areas. Limits to 3/4-cubic yard capacity buggies or other conveyances used roofs and within the building to transport removed debris. Clean up spillage from pavement, streets and adjacent areas.

3.5 INSTALLATION

- A. General: Inspect the architectural, structural, plumbing, fire protection, special systems and HVAC drawings and specifications to become familiar with the building construction and to coordinate with the work of others.
- B. Piping: Install in strict accordance with manufacturer's written installation instructions and recommendations. Install in a manner that permits expansion and contraction caused by

changes in temperature and pressure. Provide additional support as required. Run pipes straight and true, parallel to or at right angles to the building walls. Springing or forcing piping into place will not be permitted.

- C. Fixtures and Equipment: Install in strict accordance with manufacturer's written installation instructions and recommendations. Fixtures (except for handicapped) shall be roughed in only from fixture manufacturer's certified "Rough-In Measurement Drawings" which shall be submitted to the Architect for approval. Handicapped fixtures shall be installed in accordance with 2007 California Building Code rough-in measurements adjusted from manufacturer's certified drawings.

3.6 STAGING AND HOISTING

- A. Provide hoisting equipment, staging scaffold, ladders, barricades, shores or similar facilities required to properly carry out this work in accordance with all safety regulations.

3.7 EXCAVATION AND BACKFILL

- A. The Contractor shall do necessary excavations and backfill for the installation of work included in his contract.
- B. Excavation: Bury piping outside the building to a depth of not less than 3-ft below finish grade unless otherwise noted.
- C. Excavations shall be as narrow as possible and shall be braced and supported as prescribed by the State Industrial Safety Commission. Excavations shall be cleared of roots and other organic substances and debris. Debris and surplus earth shall be removed from the site. Excavations shall be maintained free of water.
- D. Backfill shall not be more than six-inch thick layers of properly dampened and solidly iron tamped approved earth or backfill material to a density of 90% compaction. Compacting by puddling will not be permitted.

3.8 ENCLOSURES AND BARRICADES

- A. The Contractor shall provide, install and maintain for the duration of the work as required, lawful and necessary barricades and railings, lights, warning signs and signals and shall take other precautions as may be required to safeguard persons, the site and adjoining property, including improvements thereon, against injuries and damages of every nature whatsoever. This requirement applies continuously (24-hours, 7-days a week) for the duration of this contract and is not limited only to regular working hours.

3.9 CONTROL AND INSPECTION

- A. The Architect or Owner shall have the right to reject materials and workmanship which in his opinion are not in accordance with this contract, to interpret contract provisions and the meaning of the drawings and specifications.
- B. The above named parties shall be allowed access to the work for observations at all times.
- C. Defective work contrary to the contract documents may be rejected without regard to state of completion, even though said work has not been rejected as a result of a previous observation.

3.10 SLEEVES, CUTTING AND PATCHING

- A. The Contractor shall be responsible for the sizing and timely placing of sleeves of piping and insulation material passing through walls, partitions, beams, floors and roof while same are under construction. If a pipe is insulated, its pipe sleeve shall be larger than the outside diameter of the insulation around the pipe. Sleeves set in concrete floor construction shall be minimum 20-gage galvanized steel. If holes and/or sleeves are not properly installed and cutting and patching becomes necessary, it shall be done at no expense to the Owner by parties approved by the Architect.
- B. Openings into existing masonry shall be core drilled or saw cut. The Contractor shall undertake no cutting or patching without first securing the Architect's written approval. Where a pipe passes through a sleeve, provide 1/2-inch minimum clearance. No joint of the pipe (or its insulation) shall touch the sleeve. Caulk around such pipe with sufficient layers of 1/8-inch neoprene and seal off opening between pipe and sleeve with non-hardening mastic.
- C. Caulking in fire walls or floors shall be made using a UL listed, fire-rated material. For pipe or conduit penetrations through fire rated floors, walls, partitions, ceilings, etc., provide firestop system complying with the UL "Fire Resistance Directory" for "Through Penetration Firestop Systems" (XHEZ).

3.11 ANCHOR BOLTS

- A. Furnish and install anchor bolts for equipment placed on concrete equipment pads or on concrete slabs. Bolts shall be of the size and number recommended by the manufacturer of the equipment and shall be located by means of suitable templates. When equipment is placed on vibration isolators, the equipment shall be secured to the isolator and the isolator to the floor, pad, or support as recommended by the vibration isolation Manufacturer.

3.12 INSTALLATION OF VALVES

- A. General:
 - 1. Valves shall be full line size unless otherwise noted. Automatic control valves are exempted.

2. Valves shall have proper clearances for handle operation and shall close tight at the specified test pressure.
3. Pump discharge check valves shall be of non-slam type.

B. Arrangement

1. Valves shall be installed in the systems so located, arranged and operated as to give complete regulation of apparatus, equipment and fixtures.
2. Valves shall be installed for accessibility and easy maintenance.
3. Gate valves shall be installed with stems horizontal to vertically upright.
4. Provide valve box at each valve in ground. Set cover flush with finished grade except in planted areas set 1-inch above grade.
5. Balance Valves: Install balance valves where shown and on each circulating return branch where two or more branches occur on domestic hot water system.
6. Provide readily accessible lubricated gas shut-off valve in gas supply to each gas burning appliance and ahead of union connection thereto, and in addition to valves on the appliance. Locate within 3-ft 10-inch of appliance.
7. Compression Stops: Install stop valve or compression stop on water supply lines to each plumbing fixture, including hose faucets. Where fixture from trim is specified with integral built-in stops, individual supply stops will not be required. Unions are not required adjacent to compression stops.
8. Hose Faucets: Mount with outlet 18-inch above finished grade or 12-inch above finished floor, unless shown otherwise.

C. Location:

1. In branches and/or headers of water piping serving a group of two or more plumbing fixtures.
2. On both inlet and outlet of all apparatus and equipment.
3. For shutoff of branch mains.
4. For flushing and sterilizing the systems.
5. Where shown on the drawings.
6. Ahead of each automatic control or regulation valve in water lines.

3.13 PIPE SUPPORTS

A. Installation:

1. Securely support piping from building construction with manufactured iron hangers, brackets, trapezes, guides, anchors and sway braces to maintain pipe alignment and prevent sagging, noise and excessive strain due to uncontrolled movement under operating conditions. Auxiliary secondary beams shall be furnished and installed under this division of the specifications wherever necessary to meet the requirements above.
2. Piping supports for each system shall be engineered as a system and the proposed system submitted for review.

3. Relocate hangers as necessary to correct unsatisfactory conditions that may become evident when system is put into operation.
4. Support of piping by wire, rope, wood or other make shift devices will not be permitted.
5. Burning of holes in beam flanges or narrow members will not be permitted.
6. Where calculated maximum travel due to thermal expansion exceeds 1 inch, provide rollers at supports.
7. Piping shall not be supported from roof decking. Furnish and install auxiliary steel members to span steel purlins to distribute the load. Refer to roof shop drawings for location of beams and purlins.
8. Sheet lead, lead wool or wood plugs shall not be accepted as a substitute of cinch anchors as a means of attaching materials and equipment to concrete.
9. Support for insulated pipe shall be outside the insulation. Protect pipe insulation at every hanger, support or guide with inserts and shields. The galvanized sheet shield shall be applied between the hanger or support and the pipe insulation. Provide saddles at all rollers of insulated pipe not equipped with inserts and shields.

3.14 SEISMIC RESTRAINT

A. Examination

1. Examine areas and equipment to receive vibration isolation and seismic and wind control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
2. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Applications

1. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by OSHPD or an agency acceptable to authorities having jurisdiction.
2. 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 due to seismic forces.
3. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

C. Seismic Restraint Installation

1. Install seismic restraint devices as necessary to meet AHJ requirements.
2. Piping Restraints:
 - a. Comply with requirements in MSS SP-127.
 - b. Space lateral supports a maximum of 40-ft on center, and longitudinal supports a maximum of 80-ft on center.

- c. Brace a change of direction longer than 12-ft.
3. Install cables so they do not bend across edges of adjacent equipment or building structure.
4. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction providing required submittals for component.
5. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
6. 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.
7. 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.
8. Drilled-in Anchors:
 - a. 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 the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons, electrical and telecommunications conduit, and gas lines.
 - b. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - c. Wedge Anchors: 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.
 - d. Adhesive Anchors: 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.
 - e. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - f. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.
9. Seismic Restraint Application
 - a. Suspended pipe, duct, cable trays, bus duct and conduit shall be restraint Type III or V.
 - b. For trapeze supported piping and conduit, the individual pipes and conduits shall be transversely and vertically restrained to the trapeze support at each restraint location.
 - c. For overhead supported components, overstress of the building structure must not occur. Bracing shall occur from:
 - 1) Flanges of structural beams
 - 2) Upper truss chords in bar joists.
 - 3) Cast in place inserts or drilled and shielded inserts in concrete structures.
 - d. Pipe Risers

- 1) Where pipes pass through cored holes, core diameters shall be a maximum of 2-inch larger than pipe O.D. including insulation. Cored holes must be packed with resilient material or firestop as specified in other sections of this specification and/or state and local codes. No additional horizontal seismic bracing is required.
- 2) Non-isolated, constant temperature pipe risers through cored holes require a riser clamp at each floor level on top of slab attached in a seismically approved manner for vertical restraint.
- 3) Isolated and/or variable temperature risers through cored holes require Type K riser resilient Guides and Anchors installed to meet both thermal expansion and seismic acceleration criteria. Each floor level shall have either a riser clamp that does not interfere with the thermal expansion/contraction of the pipe or a riser clamp/cable assembly (also non-interfering) capable of supporting the weight of the pipe between floors in the event of pipe joint failure. Riser guides and anchors shall also be selected to serve as seismic restraints.
- e. Chimneys, stacks and boiler breaching passing through floors shall be bolted at each floor level or secured above and below each floor with riser clamps.
- f. Non-isolated floor or wall mounted equipment and tanks shall use restraint Type III or V.
- g. Where base anchoring of equipment is insufficient to resist seismic forces, restraint TYPE III shall be located above the component's center of gravity to suitably resist "G" forces specified. Vertically mounted tanks and upblast tubular centrifugal fans, tanks, or similar equipment, may require this additional restraint.
- h. A rigid piping system shall not be braced to dissimilar parts of building on two dissimilar building systems that may respond in a different mode during an earthquake. Examples: Wall and roof; solid concrete wall and a metal deck with lightweight concrete fill, pipes, duct, conduit, etc., crossing a building expansion joint.

D. Exclusions From Seismic Restraint Requirements

1. With the exception of life safety components, certain components do not require seismic restraints.
2. The exclusions from seismic restraint requirements DO NOT apply for Life Safety Components as follows:
 - a. Piping: Fire protection, fuel oil, gasoline, natural gas, medical gas, compressed air, medical piping or piping that contains hazardous or corrosive materials that is 1-inch nominal diameter and larger.
3. With the exception of life safety components, the following items do not require seismic restraints:
 - a. Piping less than 2-1/2-inch diameter.
 - b. Clevis or trapeze supported piping suspended by hanger rods less than 12-inch in length (6-inch or less for fire sprinkler piping) with positive attachment to structure.

E. Accommodation Of Differential Seismic Motion

1. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the

connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 22 Sections HVAC and Plumbing for piping flexible connections.

F. Field Quality Control

1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
2. Perform tests and inspections.
3. Tests and Inspections:
 - a. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - b. 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.
 - c. Obtain Architect's approval before transmitting test loads to structure.
 - d. Provide temporary load-spreading members.
 - e. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 - f. Test to 90% of rated proof load of device.
 - g. Measure isolator restraint clearance.
 - h. Measure isolator deflection.
 - i. Verify snubber minimum clearances.
 - j. If a device fails test, modify installations of same type and retest until satisfactory results are achieved.
4. Remove and replace malfunctioning units and retest as specified above.
5. Prepare test and inspection reports.
 - a. Upon completion of installation of seismic restraint devices, a certification report prepared by the manufacturer shall be submitted in writing to the contractor indicating that systems are installed properly and in compliance with the specifications. The report must identify those areas that require corrective measures or certify that none exists. Field coordination changes to the originally submitted seismic restraint designs must be clearly defined and detailed in this report.

G. Adjusting

1. Adjust isolators after piping system is at operating weight.
2. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
3. Adjust active height of spring isolators.
4. Adjust restraints to permit free movement of equipment within normal mode of operation.

H. Demonstration

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems. Refer to Division 01 Section "Demonstration And Training."

3.15 IDENTIFICATION OF EQUIPMENT, DUCTWORK, PIPING AND VALVES

- A. Equipment Labels: Equipment furnished and installed under this section shall be provided with manufacturers metal labels securely attached to each individual piece of equipment and showing complete and comprehensive performance characteristics, size, model, serial number etc.
- B. Name Plate: Install engraved Bakelite nameplates with 1/4-inch high white letters for equipment, switches, controls, room stats, damper motors, indicating zones, etc.
- C. Valves shall have tags attached with "S" mounting. Tags shall be at least 1-1/2-inch in diameter. Tags shall be stamped with valve I.D. number (e.g. V-1) and be keyed to valve identification table submitted as part of the Operating Instruction and Maintenance Manuals.
- D. Dampers: Mark volume dampers above new or existing ceilings by attaching a bright yellow 12-inch length strip of cloth attached to damper rod. Groove ends of shafts to indicate open and closed position.
- E. Piping exposed to view shall have color coded markers as to type of use, service, and direction of flow in accordance with the latest edition of ANSI A 13.1. Locate markers at each valve, at entries to walls, and on 20-ft centers on straight runs of pipe. Provide a flow arrow at each identification marker. Labels or markers shall be made of plastic sheet with pressure sensitive adhesive suitable for the intended application.
 1. Color Coding for Labels and Bands by Hazard Classification:
 - a. Safe Materials – Green:
 - 1) Domestic cold and hot water – green with black letters.
 - 2) City water – green with white letters
 - b. Dangerous Materials – Yellow:
 - 1) Natural Gas – yellow with black letters
 - 2) Industrial cold water – yellow with black letters
 - c. Fire Protection Equipment – Red:
 - 1) Fire Sprinkler Piping – red with black letters
- F. Nameplate designations shall correspond to the identifications on the "Record Drawings."
- G. Submit to the Architect for approval a list of items to be tagged within two weeks after award of the Contract.

3.16 CLEANING

- A. Equipment, piping, ductwork, and related valves and appurtenances, etc. Clean so as to remove rust, scale, plaster or internal obstructions before covering is installed or piping or equipment is painted. No scarring or disfiguring of equipment, piping, etc. will be acceptable before covering or painting is applied.
- B. Painted Work: Parts of the work, which are to be painted or which are exposed in the finished work shall be thoroughly cleaned and made ready to receive paint finish.
- C. Completion: Upon completion of the work, the Contractor shall remove rubbish, debris and surplus materials, resulting there, from the premises together with test instruments, and equipment and shall leave the site in a neat, clean and acceptable condition as approved by the Architect.

3.17 FLUSHING OF PIPE SYSTEMS

- A. Entire pipe systems shall be flushed and cleaned of foreign matter before they are placed in service. The length and number of flushing cycles shall be governed by the complexity of the system, but in no case less than two cycles.
- B. Flushing shall be performed using a similar media that is to be carried by the piping system. (Example: Cold water piping – water; etc.)
- C. Where pipe strainers have been designed or installed into the piping network, said strainers shall be opened and strainer baskets removed and cleaned several times during the flushing of the system.
- D. Chemical Cleaning: For chemical cleaning of closed circuit systems see Section 15500.

3.18 CORROSION PROTECTION

- A. Protective coverings for underground steel piping shall be installed in strict accordance with manufacturer's written installation instructions.
- B. Testing: Covered pipe shall be tested with high voltage holiday tester in the presence of Architect prior to backfilling all holidays shall be repaired and retested.
- C. Plastic sleeves, rubber seals, or other dielectric material shall be used to isolate piping from the building structure where steel piping penetrates concrete floor slabs or walls.

3.19 PAINTING

- A. Touch-Up: If the factory finish on any equipment furnished by the Contractor is damaged in shipment or during construction of the building, the equipment shall be refinished by the Contractor to the satisfaction of the Architect.

- B. Concealed Materials: Uncoated cast iron or steel that will be concealed or will not be accessible when installations are completed shall be given one heavy coat of black asphalt before concealment.

3.20 ELECTRICAL WORK

- A. Furnish electrical interlock wiring diagrams and complete sequences of operation for equipment specified in Division 26 that must interface with other electrical, mechanical, or control equipment. These diagrams shall be submitted to both the mechanical, and electrical engineers for review and coordination.
- B. Furnish any additional line or low voltage, mechanical and control system wiring and conduit required over and above that specified in Division 26 as required for complete and functional systems is hereby specified in this Division in complete conformance with the requirements outlined in Division 26 at no additional cost to the Owner.

3.21 PENETRATIONS

- A. Duct and pipe penetrations of ceilings shall be sealed air tight with silicone caulking prior to installation of escutcheon rings.
- B. Duct and pipe walls or slab penetrations shall be sealed using a UL listed fire rated material.

3.22 PRELIMINARY OPERATIONS

- A. Should the Owner require that any portion of the system or equipment be operated prior to the final completion and acceptance of the work, the Contractor shall furnish such operation. The expense thereof will be paid, by the Owner separate and distinct from any money paid on account of the contract.
- B. For such preliminary operation, payment shall not be construed as final acceptance of the work of this contract.

3.23 OPERATING INSTRUCTIONS

- A. The Contractor shall provide the services of a competent Operating Engineer to supervise the operation of equipment specified herein and to instruct the Owner's operators during a three day operating period. The operating instruction period shall be defined as straight time working hours and shall not include nights and weekends.
- B. The Owner shall be notified in writing at least five days before each operating instruction period begins. The Owner must indicate acceptance of the instructional starting time in writing to the Contractor. Upon arrival, the various instructors shall report to the Owner.

3.24 TESTS

- A. Tests must be performed and systems approved prior to painting, covering, insulating, furring or concealing piping.
- B. Provide test equipment, instrumentations and labor in conjunction with tests.
- C. Prior to test, protect or remove control devices, air vent and other items, which are not designed to stand pressure used in test.
- D. Accomplish testing of piping in section so as not to leave a portion of pipe or joint untested.
- E. Obtain prior approval for test procedure.
- F. Responsibility for Damages: Contractor shall pay for costs for repair and restoration of work of other trades damaged by tests or cutting done in connection with tests.

3.25 REPAIRS AND RETEST

- A. Refer to related sections.
- B. Make other adjustments, repairs and alterations required to meet specified test results.
- C. Correct defects disclosed by tests or inspection; replace defective parts.
- D. Use only new materials in replacing defective parts; in case of pipe, replace with same length as defective piece.
- E. Repeat tests after defects have been corrected and parts replaced, until pronounced satisfactory.

3.26 MECHANICAL SYSTEMS STARTING

- A. Start-up all operating systems provided under Division 22.
- B. Demonstration of all operating systems provided under Division 22, including, but not limited to:
 - 1. Plumbing Equipment, Appliances and Fixtures including but not limited to Hot Water Heaters.
- C. Sequencing: Conduct demonstrations only after systems have been through start-up procedures, systems are complete and operating and operating maintenance data is complete.
- D. Verification of Conditions:
 - 1. Existing conditions: Examine preceding work to ensure that systems are operational.
 - 2. Verify with Division 26 contractor:

- a. Temporary services are disconnected and permanent utility services are capable of full load.
 - b. Connections in main switchgear and subpanels are tight.
 - c. Necessary tests and check meter readings have been made.
3. Mechanical:
- a. Specified tests on piping systems have been made.
 - b. Specified cleaning of piping systems has been completed.
 - c. Piping: Conformance with drawings, specifications, and ANSI B31.1. Replace or correct work rejected because of defects or nonconformance with drawings, specifications and ANSI B31.1.
 - d. Water treatment has been completed.
 - e. Operational and performance tests have been made.
 - f. 24 hours and recheck.
 - g. Verify plumbing fixtures operate.
 - h. Verify integrity of wiring.
 - i. Verify sensors are provided and in correct location.
 - j. Verify range of each device and check software is compatible sensor calibration.
 - k. Test voltage on each input and output.
 - l. Test start/stop points to verify correct equipment operates.
 - m. Check sensor calibration.
- E. Submit testing plan for review prior to testing. Indicate order of procedure, list items will be tested and order of testing show where controllers and devices are located.
- F. Provide report indicating equipment operated properly and as per sequence of operation.

3.27 START-UP TESTING

- A. Notification: Notify owner at least two days in advance of start-up of mechanical systems.
- B. Start-up and Testing: Conduct start-up and start-up testing in presence of owners. See applicable Division 22 Sections for specific requirements.
- C. Lubrication: Field check and field lubricate equipment requiring lubrication prior to initial operation.
- D. Code Authorities: Complete tests required by code authorities including smoke detection, fire protection and health codes.
- E. Control Systems: Ensure control systems are fully operational in manual and automatic modes.
- F. Test equipment before and after installation as applicable where necessary to determine compliance with specifications.

- G. Start-up and Testing: Conduct start-up and start-up testing in presence of Owner. See applicable Division 22 Sections for specific requirements.
 - 1. Periodically clean various strainers during initial operation until no further accumulation of foreign materials occurs. Exercise care so minimum loss of water occurs when strainers are cleaned.
 - 2. Adjust safety and automatic control instruments as necessary to place them in proper operation and sequence.
- H. Field Tests: Subject the work of Division 22 to necessary field tests after installation and before acceptance.
 - 1. Make proper corrections, repairs and replacements should tests reveal evidence of malfunction. Repeat tests until proper and successful operation is achieved.
 - 2. If final control settings and adjustments cannot be properly made to performance tests because of time of year, make field tests as first seasonal use of systems following completion of project.
- I. Cleaning and Adjusting: After test runs have been completed and systems have been demonstrated to be satisfactory and ready for permanent operation. Clean permanent pipeline strainers properly adjust valve and pump packings, secure drive guards in place, check lubrication and replenish if required.
- J. Protection: If systems are not to continue in use following start-up procedures, take steps to ensure against accidental operation or operation by unauthorized personnel.
- K. Instruct Owner's representatives once on proper operation and maintenance of mechanical systems. Include seasonal concerns and operations.
- L. Systems: Mechanical systems provided under Division 22. See applicable Division 23 Sections for additional requirements.
- M. Contractor's Representatives: Have thorough knowledge of particular installation and system.
- N. Manufacturer's Representatives: Have thorough understanding of each particular equipment and system.
- O. Scheduling: Arrange and schedule demonstration times with Owner.
- P. Location: Conduct demonstrations at Project including tours of systems.
- Q. Operating and Maintenance Date: Arrange for data to be at demonstrations. Include review of data at demonstrations.

3.28 COMPLETION DATE AND TESTING OF COMPRESSED AIR SYSTEMS:

- A. Final Acceptance Tests shall be sufficiently in advance of the contract completion date to permit the execution before that expiration of the contract of any adjustments and/or

alterations, which the final acceptance tests indicate as necessary for the proper functioning of equipment.

1. Modifications shall be completed within the number of days allotted for completion of the contract. Retests shall not relieve the Contractor of completion date responsibility.
- B. Starting and Operation: Before starting or operating equipment of systems, make through check to determine that the systems have been flushed and cleaned as required and equipment has been properly installed, lubricated and serviced. Notify owner at least three days in advance of starting these tests.

3.29 FINAL REVIEW

- A. Date and Time: At a time designated by the Owner, the entire system shall be reviewed by the Architect. The Contractor shall be present at this review.
- B. System Operation: The system shall be operating properly within water and air volumes balanced and all temperature controls adjusted. Labels shall be removed from the plumbing fixtures, and the fixtures shall be cleaned and in operating condition. Air and Water Balance Report shall be submitted to the Owner.
- C. Documentation: Certificates and documents required herein shall be in order and presented to the Architect at least two weeks prior to the review.
- D. Changes and Corrections: After the review, changes or corrections noted by the Architect as necessary for the work to comply with these specifications and the drawings shall be accomplished without delay in order to secure final acceptance to the work.

END OF SECTION

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**SECTION 22 10 00
PLUMBING**

PART 1 STANDARDS

1.1 SECTION INCLUDES

- A. The work listed or required by this section of the specifications is not intended to limit or establish the extent of the Plumbing work. The General Contractor shall be responsible for determining the extent of the Plumbing work to be done under a subcontract.

1.2 DESCRIPTION

- A. Work Included: The work includes the furnishing of all labor, materials, appliances and tools necessary for the installation, in complete working order, of plumbing systems as herein specified and as indicated on the drawings. The item of work shall include, but not be limited to, the following principal items:
1. Plumbing fixtures and equipment included in plumbing schedule or as indicated on the drawings including but not limited to the drawings and specifications.
 2. Soil, waste, grease waste and vent piping system.
 3. Potable hot water, cold water and hot water piping systems.
 4. Condensate drain piping systems.
 5. Compressed Air piping.
 6. Air Pressure Regulators including valves.
 7. Refrigerated Air Dryer, and Receiver/Storage Tank, Filters including auxiliaries and accessories. See drawings.
 8. Sleeves, hangers and seismic bracing for piping systems.
 9. Insulation of piping.
 10. Testing.
 11. Excavation and backfill.
 12. Rough-in and connection of equipment and/or fixtures furnished under sections of this specification other than Section 15400 including but not limited to the kitchen equipment.
 13. All other miscellaneous items and equipment required for a complete installation.
 14. Seismic restraints for pipe.

15. Rough-in and final gas and water connections to mechanical and kitchen equipment as required.

16. Grouting of own base plates is included as part of work in this project.

- B. All other work herein specified and shown on the accompanying drawings including addenda, change order and approved shop drawings.
- C. The Contractor shall furnish other tradesmen with all drawings and directions necessary to enable them to properly construct their work so that all the systems shall be properly interconnected.
- D. The Contractor shall be responsible for the correctness of his drawings and instructions and make, at his expense, any necessary changes in the completed work of other trades made necessary by errors in his drawings or instructions.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Work designated on drawings to be installed or performed by other sections of the specifications including Section 23 05 00: Common Work Results for Mechanical.
- B. Finish painting of equipment, piping and ductwork shall be under Division 9 Painting Section, except as noted otherwise.
- C. Equipment foundations, curbs, or equipment pads as provided under the Concrete Section or Structural Steel Section. Coordinate exact foundation sizes and elevations, and anchor bolt sizes and locations.

1.4 EQUIPMENT RESTRICTIONS

- A. Refer to Section 22 05 00

1.5 SUBMITTALS

- A. In addition to the requirements of Section 22 05 00, submittal brochures shall include the following items:

1. Piping Materials:

Waste and Vent
Compressed Air

Potable Hot and Cold Water
Condensate Drain

2. Piping Accessories:

Hangers
Hanger Supports
Hanger Brackets
Seismic Restraints

Dielectric Couplers
Insulation
Water Hammer Arrestors
Piping Identification

3. Valves:

Gate Valves	Check Valves
Ball Valves	Gas Regulators

4. Access Panels:

5. Fixtures and Equipment:

Emergency Eye Washes	Thermostatic Valves
Refrigerated Air Dryer	Receiver/Storage Tank

B. Contractor shall coordinate and provide shop drawings of the following:

1. Dimension drawings for concrete pad, curb and equipment foundations (1/4" scale minimum) including bolt sizes and locations.
2. Steel fabrication drawings for equipment and pipe supports attachments (1/8" scale).
3. Control Wiring Diagrams.

PART 2 PRODUCTS

2.1 GENERAL

- A. Plumbing fixtures, fittings or valves intended to dispense water for human consumption which contain more than 0.25% LEAD are not permitted to be sold or installed anywhere within the State of California. These devices shall be 3rd party listed to ANNEX G of NSF/ANSI 61-2008 or other approved testing standard. Evidence of compliance shall be presented to the Building Inspector prior to final inspection California Health & Safety Code 116875 (AB1963).

2.2 PIPING SYSTEMS

A. Sewer, Waste & Vent Piping:

1. Hub-less cast iron pipe and fitting with stainless steel compression couplings conforming to the requirements of CISPI Standard 301, ASTM A888 or ASTM A74 for all pipe and fittings.
2. Pipe and fittings shall be marked with collective trademark of Cast Iron Soil Pipe Institute and shall be listed by NSF International.
3. Joints for hub-less pipe and fitting shall conform to the manufacture's installation instructions, CISPI Standard 301 and local code requirements. Hub-less coupling gaskets

shall conform to ASTM Standard C-654. No-Hub couplings shall be listed by NSF International.

- B. Potable and non-potable Cold and Hot Water Piping above grade or slab indirect drain piping:
1. ASTM B88, Type "L" seamless hard drawn copper tubing with ASTM B16.22 wrought copper fittings. Joints shall be soldered with lead-free, tin-zinc alloy solder such as Harris Stay-Safe 50. Flanges, bronze solder joint, ANSI 150 lb.
 2. Condensate drain piping above grade or indirect drain piping:
 3. ASTM B88, Type "L" seamless hard drawn copper tubing with ASTM B16.22 wrought copper fittings. Joints shall be soldered with lead-free, tin-zinc alloy solder such as Harris Stay-Safe 50. Flanges, bronze solder joint, ANSI 150.
 4. Compressed Air Piping above grade or slab:
 5. Pipe:
 6. 1" and under: ASTM A-53, Schedule 80, black steel, butt welded.
 7. 2" to 6" ASTM A-53, Schedule 80, black steel, seamless.
 8. Fitting:
 9. 2" and under: Screwed: malleable iron, black, 150 lb. unions: Malleable iron, black, ground joint, 250 lb., Grinnel No. 554.
 10. 2-1/2" and over: Welded only, 3 pass, butt welded fittings.
 11. Copper:
 12. Type "L" hard drawn pre-washed copper tube with wrought copper fittings.
 13. Air Pressure Regulator Assembly:
 14. Type: High Volume Air Regulators complete with bleed-type master air valves and gauges.
 15. Capacities: 300 PSI maximum incoming air pressure up to maximum 380 scfm.
 16. Manufacturers: "Graco" or approved equal.
- C. Hangers, Supports, Brackets and Plates:
1. Horizontal pipe lines shall be carried by hangers or supports spaced according to the following schedule or supported as required by the Uniform Plumbing Code:

Schedule 40 Steel Pipe		Copper Water Pipes	
Size	Max. Spacing	Tube O.D.	Max. Spacing
3/4" – 1"	7'-0"	1" and less	6'-0"
1-1/4" – 1-1/2"	8'-0"	1-1/2" and up 8'-0"	1-1/2" and up 8'-0"
2"	10'-0"		
2-1/2"	11'-0"		
3"	12'-0"		

- Where two or more lines are run at the same elevation, trapeze hangers constructed of "Unistrut" and rods as herein specified may be used. Provide separate hangers for each branch take-off three feet in length or more. Hangers shall be set so as to allow the pipe to adjust itself to changes produced by expansion and contraction.
- Hangers for non-insulated pipelines shall be clevis type "Grinnel" Figure 260 or approved equal. Hangers for insulated pipelines shall be a "Grinnel" Figure 300 or approved equal. Hangers shall be supported on threaded rod hangers of the following sizes:

Pipe Size	Rod Size
2" and under	3/8" rods
2-1/2" and 3"	1/2" rods
4"	5/8" rods
5" and 6"	3/4" rods

- Hanger Isolation: Copper piping lines shall have "Semco" Trisolators between the hanger or bracket and the pipe.
- Supports: Supports for vertical piping shall be "Grinnel" Figure 261 or approved equal split clamps bolted around the pipe and resting on the floor slab.
- Brackets: Standoff brackets for vertical line of piping and valve assemblies shall be "Secure Strut & Hanger Co." Figure 7 or approved equal offset pipe clamps.
- Plates: Where exposed pipes pass through walls, floor and ceilings, they shall be fitted with "Beaton and Caldwell Manufacturing Company" No. 3 – A factory finish split wall plates fastened to the pipe with a set screw. Plates shall be large enough to cover the openings around the pipe.
- Seismic Bracing: Where hanger rods on horizontal runs of pipe are 24 inches in length or longer, there shall be one 3/16" x 1" steel stay bolted to each pipe hanger clamp and anchored to the wall or ceiling. Stays to ceiling shall rise at a 45 degree angle and be anchored with 5/16" bolts in chinch lead anchors for concrete construction; for steel construction clamp with beam clamps to beams. Alternate stays shall be installed on opposite sides.
- Identification of Piping: Identify and paint exposed piping, with appropriate color-coding as specified in Section 22 05 00.

2.3 VALVES

- A. Provide all valves required for draining, servicing, and full control of all piping and equipment
- B. Gate Valve
 - 1. Manufacturer based upon Stockham or Crane
 - 2. Provide solid wedge disc with non-rising stem, repackable under full operating pressure when wide open.
 - 3. Provide valves designed for 125 psig stem and 200 psig non-shock water working pressures.
 - 4. Size 2" and smaller:
 - a. Bronze body, bonnet and disc conforming to ASTM B62. Stems shall be copper silicon alloy, ASTM B371.
 - (1) Stockham
 - (a) Figure B-104, solder joint ends
 - (b) Figure B-103, NPT threaded ends.
 - (2) Crane
 - (a) Figure 1701, solder joint ends
 - (b) Figure 1701, NPT threaded ends
- C. Ball Valve
 - 1. Manufacturer based upon Stockham or Crane
 - 2. Provide valves designed for 125 psig steam and 400 psig non-shock water, oil or gas.
 - 3. Size 2" and smaller
 - a. Two-piece bronze body full port with brass with hard chrome plated ball, PTFE seats and stem seals, blowout-proof stem with lever handle.
 - (1) Stockham
 - (a) Figure No. S-214 BR-T-S, solder cup ends
 - (b) Figure S-214 BR-T-T, NPT threaded ends
 - (2) Crane

- (a) Figure 9323-B, solder joint ends
- (b) Figure 9303-B, NPT threaded ends

D. Swing Check Valve

1. Manufacturer based upon Stockham or Crane
2. Provide valves designed for 125 psig steam and 200 psig non-shock water, oil or gas.
3. Size 3" and smaller
 - a. Bronze body, horizontal swing, Y-pattern with 45° seat regrindable type, with renewable seat and disc.
 - (1) Stockham
 - (a) Figure S-321 solder joint ends
 - (b) Figure B-321, NPT thread ends
 - (2) Crane
 - (a) Figure 1342, solder joint ends
 - (b) Figure 137, NPT threaded ends

E. Relief Valve

1. Manufacturer based upon Wilkins. Equal products by McDonald Miller or Watts Regulator may be submitted for approval.
2. Potable Water Temperature and Pressure: On hot water storage tanks provide an American Society of Mechanical Engineers (ASME) rated, thermostatic, self-closing temperature and pressure relief valve, located in the relief valve openings of tanks. Valve shall have a minimum thermal discharge capacity equal to the input capacity of the heater, standard pressure setting of 125 psig and standard temperature setting of 210°F. Route discharge pipe to service sink or other approved indirect waste receptor.

2.4 INSULATION

- A. All pipe fittings and valves and duct thickness shall conform to Title 24 as a minimum. Use thickness specified, if greater than Title 24 requirements. All insulation to have a flame spread of not more than 25 and a smoke density not exceeding 50 when tested as a composite.
- B. Pipe
 1. Manufacturer based upon Johns Manville. Equal products by Schuller or Owens Corning may be submitted for approval.

2. Micro-Lok

- a. Rigid molded fiber glass pipe insulation meeting ASTM C 547
- b. Chilled water thermal conductivity ("k") value of 0.23 Btu*in/(hr*ft²*°F) at 75°F
- c. Heating hot water thermal conductivity ("k") value of 0.29 Btu*in/(hr*ft²*°F) at 200°F
- d. Maximum service temperature of 850°F
- e. Provide vapor retarder jacket AP-T PLUS white kraft paper paper reinforced with glass fiber yarn and bonded to aluminum foil, secures with self sealing longitudinal laps and butt strips or AP jacket with outward clinch expanding staples or vapor barrier mastic as needed.

3. Thermo-12 Gold (high temperature applications)

- a. Rigid molded hydrous calcium silicate meeting ASTM C 533, Type I
- b. Insulation shall be asbestos free coded throughout material thickness and maintained throughout temperature range
- c. Heating hot water thermal conductivity ("k") value of 0.45 Btu*in/(hr*ft²*°F) at 300°F.
- d. Maximum service temperature of 1200°F
- e. Compressive Strength (block): Minimum of 200 psi to produce 5% compression at 1-1/2" thickness.
- f. Noncombustible as per ASTM E136 test.

4. Zeston 2000 PVC

- a. One piece, field applied pipe fitting cover and jacketing material, gloss white, UV-resistant.

2.5 FIXTURES and Equipment (See drawing P-001 for complete plumbing fixture and equipment specifications). Make type and Model Number for fixtures and equipment are shown on drawing schedule

2.6 REFRIGERATED AIR DRYER

A. General:

1. Vendor shall supply one fully assembled, piped, and wired refrigerated compressed air dryer packaged in an elevated, epoxy powder coated cabinet. Package shall be complete with: heat exchangers, moisture separator, automatic condensate drains, all interconnecting piping, R-134A refrigerant all wired, piped and mounted onto a structural steel frame, and ready for start-up after utility connections are made. Package shall be produced by an ISO 9001 registered manufacturer to ensure consistent quality of product. Product shall meet UL1995/CSA 22.2 No. 236-95 to ensure quality components are utilized in the final design.
2. Product shall operate automatically and continuously in producing a dehydrated gas stream at pressure while maintaining a dew point of 38°F at 100 psig with site conditions of

100°F ambient and, 100°F inlet air temperature, and inlet air relative humidity of 100%. Aqueous and particulate contaminant removal shall be integral and effective to 3 micron while attaining ISO 8573.1 quality Class 4 for moisture, Class 3 for solids and Class 5 for oil content without the need for extraneous filtration. Package pressure drop shall not exceed 5 psi under rated conditions.

B. Heat Exchangers:

1. The compressed air stream shall be chilled to a temperature below the designed pressure dew point in AISI 316 stainless steel brazed plate heat exchangers with press formed, herringbone geometry heat exchange surfaces to ensure high heat transfer efficiency for the life of the dryer. No prefilter shall be required. Heat exchangers shall be fully encapsulated in non-degrading urethane foam insulation to retain maximum energy efficiency while minimizing the potential of cooling media temperature degradation. All components of the air and refrigeration circuits shall be insulated to prevent condensate.

C. Integral Coalescing Separator:

1. Design shall incorporate an integral 3-micron, two-stage, coalescing Separator/Filter.
2. Systems shall incorporate an integral 3-micron, two-stage coalescing Separator/Filter with a minimum void volume of 96% for high efficiency separation even under low flow conditions. Separator/Filters shall be mounted within the main cabinet with easy to open access doors to ensure speed and efficiency during routine filter element maintenance. Vessels of said Separator/Filter assemblies shall incorporate quick, easy access to Filter Elements to ensure speed and efficiency with minimal downtime during filter element maintenance.
3. All Filter Elements listed within this specification shall incorporate a “push-on” type of design utilizing captive o-rings to seal and secure said element without the need for screws, bolts or fasteners of any kind. All seals shall be Fluoroelastomer to ensure compatibility with all common air compressor lubricants.

D. Automatic Condensate Drains:

1. Level sensing, electric demand drains shall be included to eject the condensate, without the loss of compressed air, from the system.

E. Refrigeration System:

1. A non-cycling, direct expansion type refrigeration system shall be utilized to ensure dew point stability from zero to 100% of rated volumetric flow. At less than full rated flow conditions, a rapid response hot gas by-pass valve shall introduce high-pressure refrigerant gas after the refrigerant heat exchanger to prevent temperature variations that are detrimental to dew point stability throughout the entire range of operation. Air-cooled systems shall perform as specified throughout an ambient temperature range of 45 to 110°F (7 to 43°C,) water-cooled systems shall perform as specified throughout an ambient

temperature range of 45 to 130°F, (7 to 54°C.) Control shall be automatic without the need for load or ambient adjustments. Specifically, the dryer will be capable of operating at all flow rates down to and including 0% load without a freezing condition in the air circuit. A liquid line filter/dryer shall be supplied. Refrigeration systems shall be cleaned, purged, and evacuated prior to being charged with refrigerant. Systems shall be charged with environmentally friendly R-134A, then, leak checked and performance tested before shipment.

F. Electrical Construction:

1. Electrical construction shall be certified to meet UL1995/CSA 22.2 No. 236-95.

G. Instrumentation and Controls:

1. Controller: Standard flow models 125-750 scfm- Power On-LED, Compressor On-LED, On/Off rocker switch, dew point bar graph LED, push to test button for timed solenoid drain, and adjustment for drain interval.

H. Warranty:

1. Quality coverage shall protect user from defects in materials and/or workmanship in covering all parts and labor for a period of no less than Two-Years on the complete assembly (less normal consumables such as the Air-Side Filter Element(s) and, Normal Drain Trap maintenance.) The Heat Exchangers shall be warranted for a period of no less than Five-Years. Lifetime warranty with pre-filter and annual element replacement. User accepts the responsibility of ensuring unit is properly applied, installed, and maintained in accordance with manufacturers written instructions

I. Manufacturer: Design based on "Gardner-Denver".

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Inspect the architectural, structural, fire protection, special systems and HVAC drawings and specifications to become familiar with the type of building construction and to coordinate with the work of others.
2. All apparatus, fixtures, devices and appliances which require pipe connections shall be so equipped and each such pipe connection shall be valved or trapped, or provided with special apparatus as indicated on the drawings or elsewhere specified. Where such connections are not indicated on the drawings or specified, they shall be made in the usual manner recommended by the manufacturer of each such equipment including but not limited to the final connections to the food

service equipment. Coordinate with the Kitchen consultant drawings and specifications.

B. Piping:

1. Install in a manner that permits expansion and contraction caused by changes in water temperature and pressure. Provide additional supports as required. Run pipes straight and true, parallel to or at right angles to the building walls. Springing or forcing piping into place will not be permitted.
2. Reduced fittings shall be used in lieu of bushings. Close nipples will not be permitted.
3. Pipelines shall be installed in the locations and of the sizes shown on the drawings or specified herein and of the material and workmanship herein specified and shall be free from all stain, tool marks or other foreign substances.
4. All exposed piping in the building shall be installed parallel to or at right angles to the building walls. All pipelines shall be installed free from traps and air pockets and true to line and grade. All horizontal lines shall be installed as close to the building construction as possible so as to leave the greatest possible head room under them.
5. The only filler that may be used in making up screw joints in pipe lines shall be an approved graphite paste or Teflon tape.
6. Copper tube water lines shall be fitted with drop ear elbows securely anchored to the building framing at each fixture supply stub-out.
7. Where pipes of two dissimilar metals are joined, "Mallory" dielectric couplings or approved equal shall be installed.
8. Saw cut or core drill existing slabs or walls to install pipes, equipment or fixtures.
9. Where valves are not accessible from utility or furred spaces, the contractor shall furnish and install "Access Panels" as specified hereinafter.
10. Where screw end valves are used in threaded pipelines there shall be a union installed in the pipe as close to the valve as possible. At soldered pipelines an I.P.S. to copper adaptor shall be installed on both sides of valve screw end.
11. All vales of pipe lines of all service shall be tagged with the valve discs or nameplates as specified hereinafter, except where the use is obvious or where the apparatus controlled is visible form the valve.
12. All vales other than relief valves and air vent valves shall be the same size as the pipe lines in which they are installed. All valves shall be packed with an approved brand or graphited valve stem packing.

- C. Fixtures and Equipment:
 - 1. Install in strict accordance with manufacturer's written installation instructions and recommendations. Fixtures shall be roughed in only from fixture manufacturer's certified "Rough-In" Measurement Drawings" which shall be submitted to the Contracting Officer Representative for approval.
- D. Backflow protection devices of code approved type and shall be provided and installed where required by code.

3.02 INSULATION

- A. Verify that all surfaces are clean, dry and free of foreign material.
- B. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.
- C. Continue insulation vapor through penetrations except where prohibited by code.
- D. Piping Insulation:
 - 1. Locate insulation and cover seams in least visible locations.
 - 2. Neatly finish insulation at supports, protrusions and interruptions.
 - 3. Provide insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature with vapor retardant jackets with self-sealing laps. Insulate complete system.
 - 4. For insulated pipes conveying fluids above ambient temperature, secure jackets with self-sealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges and unions.
 - 5. Provide insert between support shield and piping on piping 1-1/2 inches (38 mm) diameter or larger. Fabricate of Johns Manville Thermo-12 or other heavy density insulating material suitable for temperature. Insulation inserts shall not be less than the following lengths:

1'1/2" to 2-1/2" pipe size	10" long
3" to 6" pipe size	12" long
 - 6. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet (3 meters) above finished floor, finish with Johns Manville Zeston 2000 PVC jacket and fitting covers or aluminum jacket.
 - 7. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints and valves shall be covered with Johns Manville Zeston 2000 PVC or aluminum jacket. Jacket seams shall be located on bottom side of horizontal piping.

3.03 SEISMIC REQUIREMENTS

- A. Equipment and piping shall be provided with seismic restraint devices to limit movement. See Section 23 05 00.

3.04 PIPE CLEANING AND DISINFECTION FOR POTABLE WATER PIPING

- A. Pipe cleaning and disinfection applied to hot and cold potable water systems and shall be performed after all pipes, valves, fixtures, and other components of the systems are installed, tested and ready for operation.
- B. All potable water piping shall be thoroughly flushed with clean potable water prior to disinfection, to remove dirt and other contaminants. Screens to faucets shall be removed before flushing and reinstalled after completion of disinfection.
- C. Disinfection shall be done using either chlorine gas or liquid chlorine. Calcium or sodium hypochlorite may be used as approved in AWWA C601 procedures.
- D. A service cock shall be provided and located at the water service entrance. The disinfecting agent shall be injected into the system from this cock only.
- E. The disinfecting agent shall be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, backflow of disinfecting agent into main water supply is not permitted.
- F. All sectional valves must be operated during disinfection. All outlets must be fully opened at least twice during injection and the residual checked with orthotolin solution.
- G. When the chlorine residual concentration, calculated on the volume of water the piping will contain, indicates not less than 50 Parts Per Million (PPM) at all outlets, then all valves must be closed and secured.
- H. The residual chlorine shall be retained in the piping systems for a period of not less than 24 hours.
- I. After the retention, the residual shall be not less than 4PPM. If less, then the process shall be repeated as described above.
- J. If satisfactory, then all fixtures shall be flushed with clean potable water until residual chlorine by orthotolin tests shall be not greater than the incoming water supply (this may be zero).
- K. All work and certification of performance shall be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance shall indicate:
 - 1. Name and location of the job and date when disinfection was performed.

2. Material used for disinfection.
 3. Retention period of disinfectant in piping system.
 4. PPM chlorine during retention.
 5. PPM chlorine after flushing.
 6. Statement that disinfection was performed as specified.
 7. Signature and address of company/ person performing disinfection.
- L. Upon completion of final flushing (after retention period), the Contractor shall obtain one water sample from hot water system and one from the cold water system and submit samples to a State approved laboratory. Results from laboratory shall be provided to Architect and shall indicate:
1. Name and address of approved laboratory testing the samples.
 2. Name and location of job and date the samples were obtained.
 3. The coliform organism count. An acceptable test shall show absence of coliform organisms.
- M. If analysis does not satisfy the above minimum requirements, the disinfection procedure must be repeated.
- N. Before acceptance of the systems, the Contractor shall submit to the Contracting Officer Representative for his or her review, three (3) copies of Laboratory Report and three (3) copies of Certification of Performance as specified above.
- O. Under no circumstances shall the Contractor permit the use of any portion of potable water systems until properly disinfected, flushed and certified.

3.05 TESTS

- A. Drainage piping shall be tested and proved tight under 10 feet of water pressure prior to replacing any ceilings.
- B. All water piping and pumped drain or forced main piping shall be purged of all air and tested and proved tight under 125 PSI hydrostatic pressure for a period of not less than two (2) hours.
- C. Air piping shall be tested with air and proved tight under 120 psi for a period of not less than two hours.

3.06 CLEANING

- A. Equipment, piping, etc., shall be thoroughly cleaned so as to remove rust, scale, plaster, or internal obstructions before a covering is installed or piping or equipment is painted. no scarring or disfiguring of equipment, piping, etc. will be acceptable before covering or painting is applied.
- B. Parts of the work which are to be painted or which are exposed in the finished work shall be thoroughly cleaned and made ready to receive paint finish.
- C. The exposed parts of equipment shall be cleaned, oil and grease removed, and the bright parts left clean and polished.
- D. Upon completion of the work, remove rubbish, debris and surplus materials, resulting there from, the premises together with his instruments, and equipment and shall leave the site in a neat, clean and acceptable condition as approved by the Architect.

3.07 PRELIMINARY OPERATIONS

- A. Should the Owner require that a portion of the systems or equipment be operated prior to the final completion and acceptance of the work, the Contractor shall furnish such operation. The expense thereof will be paid by the Owner, separate and distinct from money paid on account of the contract.
- B. Such preliminary operation or testing, payment shall not be construed as final acceptance of the work of this contract.

3.08 EXCAVATION AND BACKFILL

- A. Comply with the requirements for trenching, backfilling and compaction as specified in Division 2.

END OF SECTION

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SECTION 23 05 00
COMMON WORK RESULTS FOR MECHANICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements of Divisions 0 and 1 apply to work of this section.

1.2 RELATED SECTIONS

- A. This section applies to all sections of Division 23, except as may be otherwise modified in each section.

1.3 FEES, PERMITS AND PAYMENTS

- A. Fees, Permits and Payments: Contractor shall secure all permits and inspections and pay full cost of same.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. Work designated on drawing or specifications to be installed or performed by other sections of the inspections.
- B. Concrete
- C. Access Doors
- D. Finish painting: Equipment furnished shall be factory finished. If the factory finish is damaged during shipment, installation, etc., it shall be repainted by the Contractor subject to the Architect's approval.
- E. Louvers not connected to sheet metal plenums or ductwork.
- F. Electrical connections for motors, line voltage wiring and conduit and low voltage wiring and conduit.
- G. Individual motor controllers except when furnished as integral parts of packaged equipment.
- H. Motor Control Centers.
- I. Landscape Irrigation System.
- J. Water, sanitary and site storm piping.

1.5 EQUIPMENT RESTRICTIONS

- A. The proprietary name, and/or model indicated on the drawings, or the first listed for any category in the specifications is the make and/or model used as the basis for design. All bids shall be based on the use of the products of the selected manufacturers. Substitutions will be considered as outlined in General Conditions and Division 1; Section, "Substitutions." Other acceptable manufacturers are named in these specifications.
- B. Choice of Equipment: Equipment has been chosen, which will properly fit into the physical spaces provided and indicated, allowing ample room for access, serving, removal and replacement of parts, etc. Adequate space shall be allowed for clearance in accordance with the code requirements and the requirements of the local inspection Department. Physical dimensions and arrangements of equipment to be installed shall be subject to the Owner's approval. Submit shop drawings of equipment layout for approval where equipment space does not comply with drawings. Any changes in piping, motors, wiring, controls, structural or installation procedures required by the substituted product or equipment shall be made at no additional cost to the Owner, and with no reduction in scope.
- C. Space Requirements:
 - 1. In the preparation of drawings, a reasonable effort has been made to include all equipment manufacturers' recommendations. Since space requirements and equipment arrangement vary according to manufacturer, the responsibility for initial access and proper fit rests with the Contractor. The final arrangement of the equipment and service connections shall allow the unit to be serviced. This shall include space to pull motors, filters, coils, tubes, etc. Make changes in piping and ductwork to suit actual installed equipment without further instructions or additional cost.
 - 2. If the installation of the particular product or equipment, the Contractor has submitted, requires changes in material or size from that required in the contract drawings and specifications, such changes shall be submitted as shop drawings.
 - 3. Contractor shall be aware that some equipment in the mechanical room must be in place before walls and/or roof is installed and shall schedule the installation of equipment accordingly.
 - 4. Contractor shall pay the costs of design (3.0 x direct payroll) and installation of changes resulting from substitution of alternate products. Acceptance of alternate products by Architect does not change this requirement.

1.6 QUALITY ASSURANCE

- A. Installer's Qualifications:
 - 1. For the actual fabrication, installation and testing of work under this section, use only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturers' current recommended methods of installation.

2. In acceptance of rejection of the finished installation, no allowance will be made for lack of skill on the part of the installers.
- B. Certificates: Execute on behalf of the Owner and deliver to the Architect all manufacturers' warranty certificates and instructions, etc. required to assure that the manufacturers' warranties are properly documented and in full effect for the warranty period.
- 1.7 CODES, ORDINANCES, REGULATIONS AND DEFINITIONS

- A. Reference to technical societies, trade organizations, governmental agencies are made in Mechanical Sections in accordance with the following abbreviations:
- B. All work and materials shall be in full accordance with the latest rules and regulations of the following Agencies and Codes Division of the State Architect the Safety Orders of the Division of Industrial Safety; the California Mechanical Code; the Uniform Mechanical Code, the Uniform Plumbing Code; Uniform Fire Code; the California Plumbing Code; the California Building Code; Title 24 State Code of Regulations; city ordinances and other applicable laws or regulations.

Nothing in the drawings or specifications is to be constructed to permit work not conforming to these codes. Drawings and specifications shall take precedence when work and materials called for exceed code requirements.

- C. References to Code Specifications shall mean editions in effect at date of proposals.
- D. Reference to technical societies, trade organizations, governmental agencies are made in Mechanical Sections in accordance with the following abbreviations:

AABC	<i>Associated Air Balance Council National Standards for Field Measurement and Instrumentation, Total System Balance</i>
AGA	<i>American Gas Association</i>
AMCA	<i>Air Moving and Conditioning Association</i>
ANSI	<i>American National Standards Institute</i>
ARI	<i>Air Conditioning and Refrigeration Institute</i>
ASHRAE	<i>American Society of Heating, Refrigerating, and Air Conditioning Engineers</i>
ASTM	<i>American Society of Testing and Materials</i>
AWWA	<i>American Water Works Association</i>
CCR	<i>California Code of Regulations</i>
CISPI	<i>Cast Iron Soil Pipe Institute</i>
DSA	<i>Division of the State Architect</i>
ETL	<i>Electrical Testing Laboratory</i>
FM	<i>Factory Mutual</i>
IRI	<i>Industrial Risk Insurers</i>
ISO	<i>Insurance Service Organization</i>
NEBB	<i>National Environmental Balancing Bureau Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems</i>

NEC	<i>National Electrical Code</i>
NFC	<i>National Fire Codes</i>
NFPA	<i>National Fire Protection Association</i>
NRCA	<i>National Roofing Contractor's Association</i>
OSHA	<i>Occupational Safety and Health Administration</i>
PDI	<i>Plumbing and Drainage Institute</i>
SMACNA	<i>Sheet Metal and Air Conditioning</i>
UL	<i>Underwriter's Laboratories, Inc.</i>

E. Fees, Permits, Licenses and Payments: Contractor shall secure all permits and inspections and pay full cost of same.

F. Definitions:

APPROVED	<i>As approved by Owner's Representative.</i>
ARCHITECT / ENGINEER	<i>The Architect or Engineer of record for this project. The Architect or Engineer is the Owner's representative regarding preparation, revisions and interpretation of the contract documents.</i>
AS DIRECT	<i>As directed by the Owner's Representative.</i>
AS REQUIRED	<i>As required by applicable Code requirements; by good business practice; by the conditions prevailing; by the Contract Documents; by Owner, or by Owner's Representative.</i>
AS SELECTED	<i>As selected by Owner's Representative.</i>
BATTERY	<i>A "battery" of fixtures is two or more fixtures served from same branch.</i>
BY OTHERS	<i>Work on this Project that is outside the Scope of Work to be performed by the Contractor under this Contract, but that will be performed by Owner, other Contractors or other means.</i>
CERTIFIED TEST REPORTS	<i>Test Reports signed by an authorized official stating that tests were performed in accordance with the test method specified that the results reported are accurate, and that items tested either meet or fail to meet the stated minimum requirements. These Test Reports include those performed by Factory Mutual, Underwriters Laboratories, Inc., and others.</i>

CERTIFIED INSPECTION REPORTS	<i>Reports signed by approved Inspectors attesting that the items inspected meet the Specification requirements other than any exceptions included in the report.</i>
CONCEALED	<i>Means embedded in masonry, concrete or other construction, installed within furred spaces, or in enclosures.</i>
EQUAL	<i>The Contract documents are based upon the manufacturer and model number indicated on the drawings or specifications. Bidder may propose alternative product but will be considered only if the bidder has submitted a base Bid, which is in accordance with the specified product. Alternate proposal shall include complete technical data and itemized price adjustments. Bidder shall assume the responsibility that the alternate product meets the physical, mechanical, electrical, structural, acoustical and architectural requirements of the specified product. Acceptance of an alternate product does not entitle the Contractor to a Change Order to modify architectural, structural, mechanical, electrical, control or any other systems necessary to accommodate the alternate product. The Owner or his representative may reject any or all-alternate products.</i>
EXPOSED	<i>Means not installed underground or not concealed as defined above.</i>
FIELD TESTS	<i>Tests or analysis made at, or in the vicinity of the job site in connection with the actual construction.</i>
FURNISH	<i>Supply and deliver to the Project site only, not install (unless required to be installed elsewhere in the Contract Documents). Product must be delivered ready for installation and in operable condition.</i>
INSTALL	<i>Install (services or labor) only, not furnish (unless required to be furnished elsewhere in the Contract Documents). Install means to place in final position, complete, anchored, connected and ready to operate.</i>
MAIN	<i>A "main" of any system of continuous piping is the principal artery of the system, to which branches may</i>

	<i>be connected.</i>
MANUFACTURER'S DIRECTIONS, INSTRUCTIONS, RECOMMENDATIONS, SPECIFICATIONS	<i>Manufacturer's written directions, instructions, recommendations, specifications.</i>
PRODUCT	<i>Means all materials, systems, equipment and fixtures.</i>
MANUFACTURER'S CERTIFICATE CONFORMANCE	<i>A certificate signed by an authorized manufacturer's official attesting that the material or equipment delivered meets the specification requirements. Manufacturer's representative certificate is not acceptable.</i>
MUST; SHALL; TO; WILL	<i>When used as a directive to the Contractor, these items indicate a mandatory action.</i>
NECESSARY	<i>Essential to completion of work.</i>
OWNER-FURNISHED, CONTRACTOR-INSTALLED PROVIDE	<i>To be furnished by the Owner at its cost and installed by the Contractor as part of the work. Shall include "Furnish and install" which means supply, fabricate, deliver, place and connect, complete in place, ready for operational use. When neither furnish, install or provide is stated, "provide" is implied.</i>
REMOVE	<i>Means to remove item completely including attachments, frames, anchors, fittings, bases, pipes, conduits and supports, capping behind finished surfaces and repairing floors, bases and walls to match color and texture and be smooth with existing adjacent surfaces.</i>
RISER	<i>A "riser" is vertical waterline supplying two or more fixtures, or batteries of fixtures located in different rooms.</i>
SHOWN	<i>As indicated on the Drawings.</i>
SPECIFIED	<i>As written in the Contract Documents.</i>
SUBMIT	<i>Submit to Owner's Representative.</i>

TESTING LABORATORY *The term "testing laboratory" means any person or organization whose functions include testing, analyzing or inspecting products and/or evaluating the designs or specifications of such products according to the requirements of applicable standards.*

WORK *Work of the Contractor or Subcontractor includes labor or materials (including, without limitation, without equipment and appliance) or both, incorporated in, or to be incorporated in the construction covered by the complete Contract.*

1.8 SUBMITTALS

A. General: Refer to Division 1.

B. Project Drawings:

1. The drawings are diagrammatic and indicate the general layout of the equipment.
2. The exact location shall be field determined, after shop drawing review for the installation in available space at the job site.

C. Equipment Lists and Equipment Brochures and Shop Drawings.

1. Copies: Submit six (6) copies of data as specified hereafter.
2. All items of material and equipment required by this Division shall be reviewed by the Architect prior to the start of any work. The Contractor shall submit all items requiring such review, allowing ample time for the checking and processing, and shall assume all responsibility for delays incurred due to the rejected items. All rejected items shall be resubmitted as specified only. Submittal information covering all items shall be neatly bound together into booklets, each booklet containing all individual items specified. Separate submittals of individual items are not allowed. Each submittal item shall be identified with the governing specification section, paragraph, subparagraph, or reference drawings, as applicable.
3. Equipment Lists: Provide name of manufacturer, brand name, and catalog number of each item. Submit complete submittals, at one time, having items arranged in numerical sequence with each item identified by section and article of the specifications. Listing items "as specified" without both name and model or type designation is not acceptable, except pipe and fitting not specified by brand names may be listed "as specified" without manufacturer's name, provided proposed materials comply with specification requirements.

4. Material Brochures: Provide copies of complete description, information and performance data covering materials and equipment, which are specified. Brochures submitted to the Architect shall be published by the manufacturers and shall contain complete and detailed engineering and dimensional information. Brochures not compiled in the following manner shall be returned for re-submittal. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall not submit catalogs, which describe several different items other than those items to be used unless all irrelevant information is marked out, or unless relevant information is clearly marked. Brochures from each manufacturer shall be identified.
 5. Shop Drawings: Refer to Divisions 0 and 1. Provide additional data as specified in Governing Specification Section.
 6. Miscellaneous: Prior to installation, submit to Construction Supervisor on the job site, two copies of the following:
 - a. Shop Drawings of equipment layouts.
 - b. Installation instructions for each piece of mechanical equipment furnished.
 - c. Dimension drawings for all mechanical equipment pads and curbs including bolt sizes and locations.
 7. All submittals required by these specifications, include drawings, calculations, brochures, samples, etc. shall be submitted as one package. Partial submittals will be returned unprocessed.
- D. Record Drawings and Operating and Maintenance Books
1. Record Drawings (Refer to Division 1): On completion of work, furnish the Owner through the Architect, with a complete set electronic record drawings and shop drawings which properly reflect the locations of all equipment, fixtures, piping, ductwork, diffusers, mixing boxes, controls, etc., as actually installed. Where necessary to locate concealed equipment, dimensions, shall be included on these drawings. Maintain a separate set of drawing prints at the job site for such marking of "As-Built" locations. This set shall be updated as the installation work progresses and shall be available to the Architect at job visits. The Contractor shall indicate on the "As-Built" Drawings all deletions in green. All additions, relocations, rerouting and modifications shall be indicated in red.
 2. The format shall be AutoCad release 2016 or later. A diskette with the electronic model will be supplied to the successful bidder for this purpose. Monthly changes shall be made to the drawings on a layer named "record" and the color shall be green. A copy of the model on diskette with any "as-built" changes shall be submitted to the Architect along with all payment applications.
 3. At the end of the project, the Contractor shall take "as-built" drawings modifying the electronic drawing files to show all changes, modification or additions made during construction. These drawings will become "Record Drawings" to be delivered to the Architect.

4. Final Record Drawings shall include legends, schedules, plans, sections and details.
5. All Record Drawings shall be marked on the lower right corner with the following:
 - a. Name of Contractor
 - b. Record Drawings
 - c. Date
 - d. Building Permit Number
 - e. Letter shall be bold and print 1/4 inches high minimum.
6. Contractor shall submit to the Architect, Record Drawings as follows:
 - a. Four (4) diskette (AutoCad 2016 or later)
 - b. One (1) tracing (reproducible)
 - c. Four (4) blue prints

7. The Architect will distribute the final Record Drawings as follows:

	OWNER	ARCHITECT	ENGINEER
Diskette	1	1	1
Tracing (reproducible)	1	0	0
Blue Prints	1	1	1

8. Delivery of complete set of Record Drawings is one condition for the release of Contractor's final payment under the Contract.

E. Operating and Maintenance Books

1. Operating and Maintenance Books (Refer to Division 1): Provide the Owner through the Architect, operating instructions and maintenance data books for all equipment and materials furnished under this Division.
1. Submit five (5) copies of operating and maintenance data books to the Architect for review two weeks before final inspection of the project. Assemble all data in a single complete indexed volume and identify the size, model and features indicated for each item, as follows:
 - a. Identification readable from the outside of the cover, stating "Heating, Ventilating and Air Conditioning and/or Plumbing and/or Fire Protection Installation. Owner, by (name of company)."
 - b. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the installation.
 - c. Complete instructions regarding the operation and maintenance of all equipment involved.
 - d. Complete nomenclature of all replaceable parts, their part numbers, current cost and name and address of the nearest vendor of replacement parts.

- e. Valve identification table keyed to valve I.D. number (e.g. V-1) on brass tag attached to each valve. Table shall indicate type of valve, product or service (e.g. domestic cold water), and function (e.g. shut-off, balancing, etc.).
- f. Copy of all guarantees and warranties issued on the installation showing all dates of expiration.
- g. Copy of the Air and Water Balancing Reports.

1.9 EXPLANATION AND PRECEDENCE OF DRAWINGS

- A. For purpose of clearness and legibility, the drawings are essentially diagrammatic although size and location of equipment is drawn to scale wherever possible. The Contractor shall make use of all data in all contract documents and shall verify this information at building site.
- B. Attention is called to the inclusion of flow diagrams, riser diagrams and details. Diagrams are not for the purpose of giving physical dimensions or locations, but rather to clarify sizes and the interconnections of the piping and of the various units of the process.
- C. All other drawings of the contract set are hereby made a part of these specifications and shall be consulted by the Contractor and his work adjusted to meet the installation conditions.
- D. Drawings indicate required size and termination of pipes and ducts and suggest proper routes of piping and duct to conform to the structure, to avoid obstructions and to preserve clearance. However, it is not the intention to indicate all necessary offsets and it shall be the responsibility of the Contractor, under this section, to install ductwork and piping in such a manner as to conform to structure, avoid obstructions, preserve headroom, keeping openings and passageways clear, and make all equipment requiring inspection, maintenance and repair accessible without further instructions or extra cost to the Owner.
- E. Changes in location on all piping, apparatus and equipment as indicated on the drawings shall be made to meet the architectural and structural conditions as required and acceptable to the Architect. Any change in work which has not been installed shall be made by Contractor without additional compensation, except changes which are caused by architectural and structural changes which increase the lengths of pipe or duct runs.
- F. Contractor shall coordinate with all other trades so that no interferences shall occur, as no extras will be allowed for changes made necessary by interferences with the work between trades.
- G. CAD files plots and reproductions for this project are the property and instruments of service of dHA+CALPEC. dHA+CALPEC reserves and retains all copyright authority, privileges and rights.
 - 1. Upon request and subject to some limitations dHA+CALPEC with their client's approval, may allow contractors and/or vendors to acquire and use copies of the electronic media file data for preparation of:
 - a. Fabrication of shop drawings for this project.

- b. Submittals pertaining to this project.
 - c. Record documents.
2. Fee, payable in advance, for the preparation of files for transfer, CD Rom, or via internet e-mail shall be \$200 per file. Each individual drawing is a file for the cost calculation.
3. Applicable limitations include:
- a. The Contractor or vendor acquiring these files agrees to hold harmless dHA the Architect and Owner from all liability and/or damages resulting from their use.
 - b. The Contractor or vendor acquiring these data files assumes full responsibility for their use and for the correctness of any information or features contained therein.
 - c. dHA+CALPEC does not warranty, (explicit or implied) the accuracy of the building backgrounds, or any dimensions or features contained therein.
 - d. Usage is limited to this specific project and the specific acquirer.
 - e. The files are released solely for the convenience of the contractor or vendor acquiring same and CAD files may not be transferred to third parties without written prior approval.
 - f. dHA+CALPEC shall remove all seals, proprietary identification, etc.

1.10 COMPLETE PERFORMANCE OF WORK

- A. Practices of the Trades: Work shall be executed in strict accordance with the best practice of the trades by competent workmen.
- B. Complete Functioning of Work: All labor, materials, apparatus, and appliances essential to the complete functioning of the systems described and/or indicated, or which may be reasonably implied as essential, whether mentioned in these contract documents or not, shall be furnished and installed by the Contractor. In cases of doubt as to the work intended, or in the event of need for explanation thereof, the Contractor shall call upon the Architect for supplemental instructions.
- C. All work not shown in complete details shall be installed in conformance with accepted standard practice.

1.11 CONTROL AND OBSERVATION

- A. The Architect and Owner shall have the right to reject materials or workmanship, which in their opinion are not in accordance with this contract, to interpret contract provisions and the meaning of the drawings and specifications. The above named parties shall be allowed access to the work for observation at all times.
- B. Defective work or work in any way contrary to the contract documents may be rejected without regard to state of completion, even though said work has been accepted as a result of a previous observation.

1.12 APPROVALS

- A. All electrical equipment shall meet the listing requirements and bear a minimum of one of the following agency labels:
 - 1. Underwriter's Laboratories (UL)
 - 2. Electrical Testing Laboratories (ETL)
- B. No equipment will be accepted on the jobsite without prior written approval.

1.13 GUARANTEES

- A. In addition to any specific guarantee mentioned in these specifications, the Contractor shall leave the entire installation in complete working order and free from any and all defects in materials, workmanship or finish. Contractor shall repair or replace at his own expense any part that may develop defects due to faulty material or workmanship during the tests and within a period of one (1) year after the work is accepted by the Owner. Contractor shall guarantee also to repair or replace with like materials any existing work of the building or equipment, which is damaged during the repairing of such defective apparatus, materials or workmanship. The signing of the contract for his work covered by these specifications and of which they shall become a part, shall become a written guarantee on the part of the Contract to carry out the provisions of this section of these specifications.

1.14 DAMAGE BY LEAKS

- A. During the time period from the date of contract until termination date of this guarantee, the Contractor shall be responsible for damages to the ground, walls, roads, building, piping systems, electrical systems, heating, ventilating and air conditioning systems, building equipment, furniture and other building contents caused by leaks in the piping systems or equipment being installed or having been installed by him. All repair work shall be done as directed by, in a manner satisfactory to the Owner at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Standard of Quality: Materials and equipment shall be new and in good condition. The commercially standard items of equipment and the specific names mentioned in sections of Division 15 are intended to establish the standards of quality and performance necessary for the proper functioning of the mechanical work.
- B. Variations: Since manufacturing methods vary, reasonable minor equipment variations are expected; however, performance and material requirements are minimum. The Architect retains the right to judge equality of equipment that deviates from the specifications.

- C. Symbols are for identification. Symbols, capacities, sizes, and electrical characteristics are indicated on the drawings. Contractor shall make all necessary provisions for installation of his equipment and for attaching or connecting his work to other trades.

2.2 FLASHINGS

- A. Make all pipes and vents passing through roof or outside wall waterproof with flashings and storm collars or counter flashings.
- B. Except as otherwise noted or required, extend vent pipes passing through roof at least 12 inches above finished roofline.
- C. Furnish and install on each pipe passing through the roof a galvanized sheet metal flashing assembly with eight-inch skirt.
- D. All ductwork-penetrating roof or exterior walls shall be flashed and counter flashed with galvanized sheet metal.
- E. Furnish and install on each pipe passing through the roof a six-pound seamless lead flashing assembly with eight-inch skirt. Flashing shall have steel reinforced conical boot and be complete with open top cast iron counter flashing and permaseal waterproofing compound. For sanitary vent, provide a hood with a minimum 2 to 1 free area to vent pipe size.
- F. All ductwork-penetrating roof or exterior walls shall be flashed and counter flashed with galvanized sheet metal.

2.3 PIPE SLEEVES

- A. Provide pipe sleeves for all mechanical piping.
- B. Size pipe sleeves to permit placing pipe and specified isolation material for pipes passing through concrete or masonry walls or concrete slabs.
- C. Sleeve for pipes through floor slabs standard weight black steel pipe with top of sleeve projecting 3" above finished floor. For waterproof sleeves, use J.R. Smith Fig. 172 or equivalent by Zurn or Josam.
- D. Sleeves for pipes through walls shall standard weight black steel Schedule 40 pipe with ends flush with wall surfaces.
- E. Seal pipes passing through fire rated walls or floors. Use Dow Corning 3-6548 Silicone RTV Foam in the annular space between pipes and sleeves. Sealant through fire rated walls shall be rated with the same fire rating as the wall.
- F. Insulated pipe shall be insulated in sleeves, caulked and sealed as above. Use type CS-CW inserts as manufactured by Pipe Shields, Inc.

- G. Pipes passing through exterior walls and concrete walls shall be sealed watertight with "Linkseal" as manufactured by Thunderline Corp. Method of installation as recommended by the manufacturer.

2.4 PIPE ISOLATORS AND COVERING PROTECTION

- A. Pipe isolators: Provide each hanger or clamp for uninsulated piping with an isolation material, having metal backing, to isolate sound vibration and electrolysis. Provide Elcen "Isolator or appeared equal." Isolator not required for fire protection automatic sprinkler piping, waste, vent and natural gas piping.

2.5 ELECTRIC MOTORS

- A. All horizontal mounted fan and pump motors (close coupled excepted) shall be of the "Premium" efficiency type. Provide General Electric "Energy Saver," Westinghouse "Tee 11", U.S. Motors,"XB", Baldor "Super E", "Lincoln" "Ultimate EI" motors or approved equal unless otherwise specified. Guaranteed minimum full load efficiencies shall be certified in accordance with Institute of Electrical and Electronic Engineers (IEEE) Standard 112 Test Method B, National Electric Manufacturers' Association (NEMA) MG-1-12.53a, and shall meet or exceed the following minimum criteria:

GUARANTEED MINIMUM FULL-LOAD NOMINAL EFFICIENCY						
MOTOR HORSEPOWER	OPEN MOTORS			ENCLOSED MOTORS		
	1,200 rpm	1,800 rpm	3,600 rpm	1,200 rpm	1,800 rpm	3,600 rpm
1	80.0	82.5	--	80.0	82.5	75.5
1.5	84.0	84.0	82.5	85.5	84.0	82.5
2	85.5	84.0	84.0	86.5	84.0	84.0
3	86.5	86.5	84.0	87.5	87.5	85.5
5	87.5	87.5	87.5	87.5	87.5	87.5
7.5	88.5	88.5	87.5	89.5	89.5	88.5
10	90.2	89.5	88.5	89.5	89.5	89.5

1. 1/2 HP and Larger: 208 Volt 3 phase, 60 Hertz.
2. Smaller than 1/2 HP: 115 Volt, 1 phase, 60 Hertz.

B. General:

1. All motors shall be started across the line unless otherwise specified. Motors shall be selected with low starting current and shall be designed for continuous duty to provide the running torque and pull-in-torque required to suit the load. Unless otherwise specified, all motors shall be single speed –1750 rpm.
2. All motors shall have standard drip-proof enclosure unless otherwise specified.

3. All motors exposed to weather shall be of the totally enclosed fan-cooled type.
 4. All motors shall have at least 1.15 service factor. Motors shall be selected to operate at design conditions without exceeding nameplate ratings without operating using the service factor.
 5. Motors shall be sealed or field-lubricated in which case the latter shall be provided with grease fittings.
 6. Pump motors shall be selected to drive the pump through its characteristic curve, from zero to 25% above the design flow, without exceeding rated full load nameplate horsepower. Pump motor nameplate rating shall not be exceeded in pump operation anywhere in the pump curve.
- C. Three-Phase: All three-phase motors 10 horsepower and smaller shall have cast iron or steel housings and shall be of the squirrel cage induction type. All three-phase motors 15 horsepower and larger shall have cast iron housings and shall be of the squirrel cage induction type.
- D. Single Phase: Single phase motors shall be capacitor-start type having internal thermal overload protection and with starting, pull-in and running characteristics to suit the load.
- E. Where motor is an integral part of equipment, motor manufacturer shall be as recommended by the equipment manufacturer. However, all other items shall comply with these specifications.
- F. Nameplate: A motor nameplate shall be securely affixed to each motor and shall clearly indicate the class of insulation and the service factor in addition to the usual electrical data.
- G. Special Requirements: Refer to various sections of this Division for special requirement for specific items of equipment requiring motors.
- H. Submittals: Manufacturer's data for all equipment requiring motors shall be submitted for review. Indicate the motor manufacturer, motor horsepower, voltage, speed, efficiency, special torque requirements, enclosure and other special requirements.

2.6 MOTOR CONTROLLERS

- A. Where required: In general, motor controllers for all motors shall be furnished and installed under Division 16 unless indicated or specified otherwise. Any motor controller that is not an integral part of a piece of equipment shall be furnished under this Division and shall be installed in accordance with the following specifications.
- B. General: The motor controller shall be steel mounted. Controllers shall be front wired and all terminals shall be accessible for wiring directly from the front. No slate or ebony asbestos shall be permitted on any size controller from size 00 through size 8. All contacts shall be solid silver cadmium oxide alloy. Bare copper or silver flashed contacts shall not be permitted. Operating coils shall be pressure molded and so designed that if accidentally connected to

- excessive voltage, they will not expand, bubble or melt. When a coil fails under over-voltage condition, the motor controller shall definitely drop and not freeze the contacts in the "on" position.
- C. Overload Relays: Overload relays shall be furnished for all three phases and shall be of the hand-reset variety so that blocking the reset mechanism in the reset position will not prevent the starter from dropping out if the motor is overloaded. This specifically excludes those overload relays which change to automatic reset from hand-reset when the reset mechanism is blocked unless the automatic reset feature can be removed or voided. Accidental depressing of the reset button or mechanism shall not shut off the motor. Overload relays shall not be field convertible from hand to automatic reset type.
- D. Interlocks: Provide space to field-add one or more extra N.O. or N.C. interlocks to all (except size 00) motor controllers without removing existing wiring or removing the controller from its enclosure.
- E. Bulletin Numbers: Any full voltage magnetic motor controller to be furnished under this Division shall be similar and approved equal to Allen-Bradley (AB) Bulletin Numbers as follows:
1. Individual three phase motor controller – AB Bul. 709.
 2. Individual single phase motor controller – AB Bul. 709SP.
 3. Combination three phase motor controller with fusible or nonfusible disconnect switch –AB Bul. 712.
 4. Combination three motor controller with circuit breaker –AB Bu. 713.
 5. Individual three multi-speed motor controller for two speed, single or two winding motors – AB Bul. 716.
 6. Combination three phase multi-speed controller with circuit breakers for two speed, single or two winding motors –AB Bul. 717.
- F. NEMA Type: In general, motor controller enclosures shall be NEMA Type 1 general purpose unless exposed to the weather or otherwise indicated on the drawings. Any motor controller exposed to the weather shall have NEMA Type 3R watertight enclosure.
- G. Holding Coils: General holding coils in full voltage magnetic motor controllers shall be suitable for use on 120 Volt A.C. control voltage.
- H. Overload Protection: All three phase full voltage magnetic motor controller shall be suitable for us on 120 Volt A.C. control voltage.
- I. Manual Controllers: Manual motor controllers where indicated on the drawings, required and/or specified shall be similar and equal to Allen Bradley Bul. 600 in NEMA Type 1 enclosure or otherwise required for the location of the installation.

- J. Accessories: Motor controllers shall be provided with accessories such as control power transformers, push buttons, selector switches, pilot lights, etc., as indicated on the drawings and as specified herein. In general, most motor controllers shall include a maintain-contract start-stop button or run switch.
- K. Manufacturer: Allen-Bradley or approved equal.

2.7 BELT DRIVES AND GUARDS

- A. Belt Driven Equipment: Provide with V-belt type, adjustable-pitch driving sheaves for up through 25 HP motors. 30 HP and above shall have fixed pitch. Provide additional drive changes for all motors when necessary to meet specified CFM for final air balance (one change minimum) at no additional cost to owner.
- B. Drives: Minimum HP rating of 1.5 times motor nameplate HP.
- C. Sheaves: Cast iron, machined and balanced and keyed to shaft and locked with Allen type set screws.
- D. Pitch Diameters: Minimum 3.0 inches for A section belts, minimum 5.0 inches for B section belts.
- E. Guards: Provide belt drives with guards per OSHA requirements, all metal construction, with angle iron framework with 1/2 inch expanded metal front panels and removable section held in place with studs and wing nuts for easy replacement of belts. Provide openings at shaft ends for tachometer readings.

2.8 ESCUTCHEONS

- A. Provide heavy chrome-plated or nickel plated plates or approved pattern on pipe passing through floors, walls and ceilings in finished areas. Escutcheons shall be chrome-plated steel plates with concealed hinges and setscrew. Pattern shall be approved by the Architect.

2.9 CORROSION PROTECTION

- A. Prior to delivery to the job site, wrap buried steel pipe with corrosion protective wrap of pressure sensitive polyvinyl chloride or polyethylene tape applied after pipe has been thoroughly cleaned. Tape shall be nominal thickness of 20 mils consisting of one layer of 20 mil tape or two separate layers of 10 mil tape. Apply with suitable primer adhesive recommended by manufacturer.
- B. Tightly apply tapes with 1/2 inch minimum uniform lap, free from wrinkles and voids. Use approved wrapping machines and experienced operators.
- C. Tapes: "Chasekote" No. 775, Plicoflex No. 340-25, Polyker 922 and 923, "Scotchwrap" No. 51 or equal. Apply tape after pipe is cleaned as recommended by the tape manufacturer.

- D. Cover filed joints and fittings by wrapping polyethylene or polyvinyl tape specified for wrapping piping, except use two layers of 10 mil thick tape. Wrap joints to provide minimum of six-inches over adjacent pipe covering. Where fittings are wrapped, width of tape shall not exceed two inches. Apply adequate tension so tape will conform tightly to contours of fittings. Use putty tape insulation compounds such as "Scotchfil" or equal to fill voids and provide smooth even surface for application of tape wrap.
- E. Alternate: In lieu of tape wrap, factory applied plastic coating on steel pipe will be acceptable. Use tapes for field joints, fittings and valves same as specified above. Pipe Coating: "X-Tru Coat" (20 mil thick) as manufactured by Standard Pipe Protection, Republic, Pipe Line Service Corp., Scotchkote 202 (12 mil thick) as manufactured by 3M Company, or equal, with "X-Tru-Tape", or equal, for joints and valves.
- F. Test wrapped or coated pipe, fittings and field joints on job site, after assembly, with approved high voltage holiday detector Tinker and Rasor, or equal, with positive signaling device to indicate any flaws, holes or breaks in wrapping. Set peak voltage to 10,000 volts. If Scotchkote 202 is used, set peak voltage to 1,000 volts. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Architect or his representative.
- G. No special precautions are required for copper or plastic piping below grade.
- H. Special wrapping is required for contact with concrete such as thrust blocks or floor slabs. Piping shall be wrapped with minimum 8 mil thick polyethylene plastic sheets.

2.10 ACCESS COVER AND ACCESS DOORS

- A. Provide access covers over under floor buried mechanical valves, controls, cleanouts, located in interior and exterior floor and grade areas.
- B. Provide access door over concealed mechanical valves, controls, duct coils, dampers, fire dampers, pipe chases, concealed mechanical equipment through fire rated walls and ceilings.
- C. Provide fire rated doors for access to mechanical equipment valves.
- D. Access covers – Interior concrete floors:
 - 1. Type: Square or rectangular frame with hinged and secured cover.
 - 2. Size: Nominal 10" x 10".
 - 3. Construction: Aluminum alloy frame and hinged score rated XH cover with lifting device. Secure with vandal proof screws.
 - 4. Marking: Cast cover with words "CLEANOUT", "GAS SHUT-OFF" or "WATER SHUT-OFF" when used for these services.
 - 5. Acceptable manufacturers: Smith No. 4915, Zurn, Josam.

E. Access Covers – Interior vinyl/asbestos tile floors:

1. Type: Square or rectangular frame with recessed cover.
2. Size: Nominal 10" x 10".
3. Construction: Aluminum alloy frame and tile recess XH cover with lifting device. Secure with vandal proof screws at each corner.
4. Acceptable manufacturers: Smith No. 4920, Zurn, Josam.

F. Access Doors – Walls and ceilings:

1. Type: Flush or recessed panel.
2. Size: Minimum 12" x 12" nominal door for hand access, minimum 16" x 20" nominal door for personal access.
3. Location and style:

Masonry/concrete walls	Milcor "M" Standard
Gypsum wallboard walls and ceilings	Milcor "M" Standard
Plastered surfaces (except toilet and kitchen walls)	Milcor "K" Standard
Tile/terrazzo/kitchen/toilet room walls (with casing bead stainless)	Milcor "M" Standard
Acoustical tile (check type of ceiling system)	Milcor "A"
General areas	Milcor "M" Standard
Fire rated shafts, rated walls and ceilings	Milcor "B" Standard
4. Material:
 - a. Stainless Steel, No. 302 with No. 4 finish.
 - b. Standard manufacturer's standard construction and finish for type specified.
5. Locking:
 - a. Screwdriver: Flush screwdriver operated with case hardened cam.
6. Acceptable Manufacturers Milcor, Zurn, Miami, Carey, Potter-Roemer.

PART 3 - EXECUTION

3.1 SUPERVISION

- A. The Contractor shall furnish the services of a Superintendent experienced in the work of each section who shall be constantly in charge of the progress of the work, together with all the

necessary journeymen, helpers and laborers required to properly unload, erect, connect, adjust, start, operate and test the work involved.

3.2 PROTECTION, CARE AND CLEANING

- A. The premises shall be maintained as required by Division 1.
- B. Materials and Equipment:
 - 1. Effectively protect materials and equipment to be installed on a project against moisture, dirt and damage during the construction period, to the entire satisfaction of the Owner. Special care shall be taken to provide protective and similar equipment that are particularly vulnerable to grit and dirt.
 - 2. Keep interior of ductwork free of dirt, grit, dust, installation and other foreign materials at all times. Do not operate air distribution equipment until building is cleaned and air filters installed in order to prevent soiling of diffusers, ducts, air handling equipment, and buildings. Provide new set of filters after final acceptance of air distribution systems.
 - 3. Drain and flush piping to remove grease and foreign matter. Thoroughly clean out valves, traps, strainers, and demonstrate the cleanliness to the Owner.

3.3 EXISTING UTILITIES AND SERVICES

- A. Location and character of principal existing utilities, including dimensions, as shown on the drawings for convenience only, are believed complete and correct, but shall be subject to verification by the Contractor, as the Owner assumes no responsibility for their correctness.

3.4 INTERRUPTION OF EXISTING UTILITIES OR SERVICES

- A. Refer to Divisions 0 or 1.
- B. Submit for appraisal to the Owner a written schedule for the shutdown, removal, installation and connection of materials. Any shutdown of the existing utility services shall be coordinated as specified or advised.

3.5 EXISTING FACILITIES TO BE REMOVED

- A. Utilities and related equipment: Remove existing equipment and utilities, indicated and cap or plug utility line air/water tight in a manner approved by the Architect. Remove equipment and deliver to a location in accordance with instructions of the Architect. If utility lines are encountered that are not shown on the drawings, contact the Architect for further instructions.
- B. Concrete Pads: Saw cut and remove concrete pads as indicated.
- C. Patching: Where removals leave holes on damaged surfaces exposed in the finished work, patch and repair those holes and damaged surfaces to match adjacent surfaces. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to

produce surfaces suitable for receiving a new work. Finished surfaces of patched area shall be flush with the adjacent existing surface as possible as to texture and finish.

3.6 DISPOSITION OF MATERIALS

- A. Refer to Divisions 1 and 2.

3.7 CLEAN-UP

- A. Debris and Rubbish: Remove and transport debris and rubbish in a manner that will prevent spillage on pavement, streets, or adjacent areas. Limits to 3/4 cubic yard capacity buggies or other conveyances used roofs and within the building to transport removed debris. Clean up spillage from pavement, streets and adjacent areas.

3.8 INSTALLATION

- A. General: Inspect the architectural, structural, plumbing, fire protection, special systems and HVAC drawings and specifications to become familiar with the building construction and to coordinate with the work of others.
- B. Piping: Install in strict accordance with manufacturer's written installation instructions and recommendations. Install in a manner that permits expansion and contraction caused by changes in temperature and pressure. Provide additional support as required. Run pipes straight and true, parallel to or at right angles to the building walls. Springing or forcing piping into place will not be permitted.
- C. Fixtures and Equipment: Install in strict accordance with manufacturer's written installation instructions and recommendations. Fixtures (except for handicapped) shall be roughed in only from fixture manufacturer's certified "Rough-In Measurement Drawings" which shall be submitted to the Architect for approval. Handicapped fixtures shall be installed in accordance with Title 24 California Administrative Code rough-in measurements adjusted from manufacturer's certified drawings.

3.9 STAGING AND HOISTING

- A. Provide all hoisting equipment, staging scaffold, ladders, barricades, shores or similar facilities required to properly carry out this work in accordance with all safety regulations.

3.10 EXCAVATION AND BACKFILL

- A. The Contractor shall do all necessary excavations and backfill for the installation of all work included in his contract.
- B. Excavation: Bury piping outside the building to a depth of not less than 3'-0" below finish grade unless otherwise noted.
- C. Excavations shall be as narrow as possible and shall be braced and supported as prescribed by the State Industrial Safety Commission. Excavations shall be cleared of all roots and other

organic substances and debris. All debris and surplus earth shall be removed from the site. All excavations shall be free of water at all times.

- D. Backfill shall not be more than six-inch thick layers of properly dampened and solidly iron tamped approved earth or backfill material to a density of 90% compaction. Compacting by puddling will not be permitted.

3.11 ENCLOSURES AND BARRICADES

- A. The Contractor shall provide, install and maintain for the duration of the work as required, all lawful and necessary barricades and railings, lights, warning signs and signals and shall take other precautions as may be required to safeguard persons, the site and adjoining property, including improvements thereon, against injuries and damages of every nature whatsoever. This requirement applies continuously (24 hours, 7 days a week) for the duration of this contract and is not limited only to regular working hours.

3.12 CONTROL AND INSPECTION

- A. The Architect or Owner shall have the right to reject materials or workmanship which in his opinion are not in accordance with this contract, to interpret contract provisions and the meaning of the drawings and specifications.

The above named parties shall be allowed access to the work for observations at all times.

- B. Defective work in anyway contrary to the contract documents may be rejected without regard to state of completion, even though said work has not been rejected as a result of a previous observation.

3.13 SLEEVES, CUTTING AND PATCHING

- A. The Contractor shall be responsible for the sizing and timely placing of sleeves of all piping and insulation material passing through walls, partitions, beams, floors and roof while same are under construction. If a pipe is insulated, its pipe sleeve shall be larger than the outside diameter of the insulation around the pipe. Sleeves set in concrete floor construction shall be minimum 20 gauge galvanized steel. If holes and/or sleeves are not properly installed and cutting and patching becomes necessary, it shall be done at no expense to the Owner by parties approved by the Architect.
- B. All openings into existing masonry shall be core drilled or saw cut. The Contractor shall undertake no cutting or patching without first securing the Architect's written approval. Where a pipe passes through a sleeve, provide 1/2" minimum clearance. No joint of the pipe (or its insulation) shall touch the sleeve. Caulk around such pipe with sufficient layers of 1/8 inch neoprene and seal off opening between pipe and sleeve with non-hardening mastic.
- C. Caulking in fire walls or floors shall be made using a UL listed, fire-rated material. For pipe or conduit penetrations through fire rated floors, walls, partitions, ceilings, etc., provide firestop system complying with the UL "Fire Resistance Directory" for "Through Penetration Firestop

Systems" (XHEZ). F and T ratings shall be as required by CCR Title 24, Part 2, Section 714 for the penetrated assembly. Representative systems for insulated pipe are WJ5005, WJ5007, WJ5009, and for non-insulated conduit CAJ1034. Do not continue insulation material through fire rated wall or floor.

3.14 ANCHOR BOLTS

- A. Furnish and install anchor bolts for all equipment placed on concrete equipment pads or on concrete slabs. Bolts shall be of the size and number recommended by the manufacturer of the equipment and shall be located by means of suitable templates. When equipment is placed on vibration isolators, the equipment shall be secured to the isolator and the isolator to the floor, pad, or support as recommended by the vibration isolation Manufacturer.

3.15 LUBRICATION

- A. Where Necessary: Provide means for lubricating all bearings and other machine parts. If a part requiring lubrication is concealed or inaccessible, extend a lubrication tube with suitable fitting to an accessible location and identify it.
- B. After Installation: Properly lubricate all parts requiring lubrication and keep them adequately lubricated until final acceptance by Owner.

3.16 INSTALLATION OF EQUIPMENT

- A. Floor mounted equipment shall be set on housekeeping pads extending 6" minimum beyond sides of the equipment. Housekeeping pads shall be 4" high (minimum) unless otherwise shown on drawings. The housekeeping pads and bases shall be of.
- B. Equipment shall be secured in place using fasteners as recommended by SMACNA's Guideline for Seismic Restraints of Mechanical Systems latest edition.
- C. Vibration Isolation: Vibration of motors, fans and other moving machinery shall be effectively isolated to prevent vibration transmission to building. Isolation shall prevent noise transmission through structure and slabs. Equipment shall be set on or suspended from neoprene and steel spring vibration dampeners of proper rating as specified herein, as shown on drawings, or as otherwise required. Fans and motors shall be secured to a common base.

3.17 INSTALLATION OF VALVES

- A. General:
 - 1. Valves shall be full line size unless otherwise noted. Automatic control valves are exempted.
 - 2. Valves shall have proper clearances for handle operation and shall close tight at the specified test pressure.
 - 3. Pump discharge check valves shall be of non-slam type.

B. Arrangement

1. Valves shall be installed in the systems so located, arranged and operated as to give complete regulation of all apparatus, equipment and fixtures.
2. Valves shall be installed for accessibility and easy maintenance.
3. Gate valves shall be installed with stems horizontal to vertically upright.
4. Provide valve box at each valve or cock in ground. Set cover flush with finished grade except in planted areas set 1" above grade.
5. Balance Valves: Install balance valves where shown and on each circulating return branch where two or more branches occur on domestic hot water system.
6. Provide readily accessible lubricated gas shut-off valve in gas supply to each gas burning appliance and ahead of union connection thereto, and in addition to any valve on appliance. Locate within 3'-10" of appliance.
7. Compression Stops: Install stop valve or compression stop on water supply lines to each plumbing fixture, including hose faucets. Where fixture from trim is specified with integral built-in stops, individual supply stops will not be required. Unions are not required adjacent to compression stops.
8. Hose Faucets: Mount with outlet 18" above finished grade or 12" above finished floor, unless shown otherwise.

C. Location:

1. In branches and/or headers of water piping serving a group of two or more plumbing fixtures.
2. On both inlet and outlet of all apparatus and equipment.
3. For shutoff of branch mains.
4. For flushing and sterilizing the systems.
5. Where shown on the drawings.
6. Ahead of each automatic control or regulation valve in water lines.

3.18 PIPE SUPPORTS

A. Installation:

1. Securely support piping from building construction with manufactured iron hangers, brackets, trapezes, guides, anchors and sway braces to maintain pipe alignment and

prevent sagging, noise and excessive strain due to uncontrolled movement under operating conditions. Auxiliary secondary beams shall be furnished and installed under this division of the specifications wherever necessary to meet the requirements above.

2. Piping supports for each system shall be engineered as a system and the proposed system submitted for review.
3. Relocate hangers as necessary to correct unsatisfactory conditions that may become evident when system is put into operation.
4. Support of piping by wire, rope, wood or other make shift devices will not be permitted.
5. Burning of holes in beam flanges or narrow members will not be permitted.
6. Where calculated maximum travel due to thermal expansion exceeds 1", provide rollers at all types of supports.
7. Where rods exceed 12" in length for pipes 2" and larger and all trapezes, lateral sway bracing shall be provided at every third hanger. As a minimum, each straight run of pipe shall be equipped with a longitudinal sway brace at 40'-0" maximum. Sway brace rods shall either be two hanger or 1-1/2 x 1-1/2 x 1/8" angle iron to 2" and smaller pipe size and 2" x 2" x 1/4" for larger pipes, set on 45°. Secure bracing to pipe and structure as for hangers. All hanger rods not sway braced shall be fitted at the top with a swivel. In no case shall Code limits be exceeded.
8. Piping shall not be supported from roof decking. Furnish and install auxiliary steel members to span steel purlins to distribute the load. Refer to roof shop drawings for location of beams and purlins.
9. Sheet lead, lead wool or wood plugs shall not be accepted as a substitute of cinch anchors as a means of attaching materials and equipment to concrete.
10. Support for insulated pipe shall be outside the insulation. Protect pipe insulation at every hanger, support or guide with inserts and shields. The galvanized sheet shield shall be applied between the hanger or support and the pipe insulation. Provide saddles at all rollers of insulated pipe not equipped with inserts and shields.

3.19 IDENTIFICATION OF EQUIPMENT, PIPING AND VALVES

- A. Equipment Labels: All equipment furnished and installed under this section shall be provided with manufacturers metal labels securely attached to each individual piece of equipment and showing complete and comprehensive performance characteristics, size, model, serial number etc.
- B. Name Plate: Install engraved Bakelite nameplates with 1/4" high white letters for all [new and relocated equipment], switches, controls, room stats, damper motors, indicating zones, etc.

- C. Valves shall have tags attached with "S" mounting. Tags shall be at least 1-1/2 inches in diameter. Tags shall be stamped with valve I.D. number (e.g. V-1) and be keyed to valve identification table submitted as part of the Operating Instruction and Maintenance Manuals.
- D. Dampers: Mark all volume dampers above new or existing ceilings by attaching a bright yellow 12" length strip of cloth attached to damper rod. Groove ends of shafts to indicate open and closed position.
- E. Piping exposed to view shall have color coded markers as to type of use, service, and direction of flow in accordance with the latest edition of ANSI A 13.1. Locate markers at each valve, at entries to walls, and on 20 foot centers on straight runs of pipe. Provide a flow arrow at each identification marker. Labels or markers shall be made of plastic sheet with pressure sensitive adhesive suitable for the intended application.
 - 1. Color Coding for Labels and Bands by Hazard Classification:
 - a. Safe Materials – Green:
 - 1) Domestic cold and hot water – green with black letters.
 - 2) City water – green with white letters
 - 3) Chilled water – green with white letters
 - b. Dangerous Materials – Yellow:
 - 1) Natural Gas – yellow with black letters
 - 2) Industrial cold water – yellow with black letters
 - 3) Heating hot water – yellow with black letters
 - c. Fire Protection Equipment – Red:
 - 1) Fire Sprinkler Piping – red with black letters
 - F. Nameplate designations shall correspond to the identifications on the "Record Drawings."
 - G. Submit to the Architect for approval a list of items to be tagged within two (2) weeks after award of the Contract.

3.20 CLEANING

- A. Equipment, piping, ductwork, and related valves and appurtenances, etc. Clean so as to remove rust, scale, plaster or any internal obstructions before any covering is installed or any piping or equipment is painted. No scarring or disfiguring of equipment, piping, etc. will be acceptable before covering or painting is applied.
- B. Painted Work: All parts of the work, which are to be painted or which are exposed in the finished work shall be thoroughly cleaned and made ready to receive paint finish.

- C. Exposed Equipment: The exposed parts of equipment shall be cleaned, oil and grease removed, and the bright parts left clean and polished.
- D. Completion: Upon completion of the work, the Contractor shall remove all rubbish, debris and surplus materials, resulting there, from the premises together with all test instruments, and equipment and shall leave the site in a neat, clean and acceptable condition as approved by the Architect.

3.21 FLUSHING OF PIPE SYSTEMS

- A. Entire new and existing pipe systems shall be flushed and cleaned of all foreign matter before they are placed in service. The length and number of flushing cycles shall be governed by the complexity of the system, but in no case less than two (2) cycles.
- B. Flushing shall be performed using a similar media that is to be carried by the piping system. (Example: Cold water piping – water; etc.)
- C. Where pipe strainers have been designed or installed into the piping network, said strainers shall be opened and strainer baskets removed and cleaned several times during the flushing of the system.
- D. Chemical Cleaning: For chemical cleaning of closed circuit systems see Related Section.

3.22 CORROSION PROTECTION

- A. Protective coverings for underground steel piping shall be installed in strict accordance with manufacturer's written installation instructions.
- B. Testing: Covered pipe shall be tested with high voltage holiday tester in the presence of Owner's representative prior to backfilling all holidays shall be repaired and retested.
- C. Plastic sleeves, rubber seals, or other dielectric material shall be used to isolate piping from the building structure where steel piping penetrates concrete floor slabs or walls.

3.23 PAINTING

- A. Painting:
 - 1. Finish painting of mechanical equipment shall be as specified in Division 9, unless otherwise specified in Division 15.
 - 2. Equipment shall be provided with factory applied prime finish, unless otherwise specified.
- B. Touch-Up:
 - 1. If the factory finish on any equipment furnished by the Contractor is damaged in shipment or during construction of the building, the equipment shall be refinished by the Contractor to the satisfaction of the Architect.

C. Concealed Materials:

1. Uncoated cast iron or steel that will be concealed or will not be accessible when installations are completed shall be given one heavy coat of black asphalt before concealment.

3.24 ELECTRICAL WORK

- A. Furnish all electrical interlock wiring diagrams and complete sequences of operation for equipment specified in Division 16 that must interface with other electrical, mechanical, or control equipment. These diagrams shall be submitted to both the mechanical, and electrical engineers for review and coordination.
- B. Furnish any additional line or low voltage, mechanical and control system wiring and conduit required over and above that specified in Division 16 as required for complete and functional systems is hereby specified in this Division in complete conformance with the requirements outlined in Division 16 at no additional cost to the Owner.

3.25 PENETRATIONS

- A. All duct and pipe penetrations of ceilings shall be sealed air tight with silicone caulking prior to installation of escutcheon rings.
- B. All duct and pipe walls or slab penetrations shall be canceled using a UL listed fire rated material.

3.26 SEISMIC RESTRAINT CODE REQUIREMENTS

- A. Seismic Design: Contractor shall be responsible for all anchors and connections of mechanical work to the building structure to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. Provide structural calculations certified and stamped by a Registered Professional Structural Engineer in the State of California prior to installation.
 1. Equipment anchorage shall be as follows:
 - a. All mechanical equipment over 500 lbs., shall be braced or anchored in accordance with the regulations of Title 24, CCR and/or 2001 California Building Code and/or the following, whichever is most restrictive.
 - b. Where anchorage details are not shown on the drawings the field installation shall be subject to the approval of the Structural Engineer.
 - c. Where platform details, anchorage details, or location are not shown or are different than shown on the drawings, the field installation shall be subject to the approval of the Structural Engineer and the Division of the State Architect.

3.27 PRELIMINARY OPERATIONS

- A. Should the Owner require that any portion of the system or equipment be operated prior to the final completion and acceptance of the work, the Contractor shall furnish such operation. All the expense thereof will be paid, by the Owner separate and distinct from any money paid on account of the contract.
- B. For such preliminary operation, payment shall not be construed as final acceptance of any of the work of this contract.

3.28 OPERATING INSTRUCTIONS

- A. The Contractor shall provide the services of a competent Operating Engineer to supervise the operation of all equipment specified herein and to instruct the Owner's operators during a one day operating period. The operating instruction period shall be defined as straight time working hours and shall not include nights and weekends.
- B. The Owner shall be notified in writing at least five days before each operating instruction period begins. The Owner must indicate acceptance of the instructional starting time in writing to the Contractor. Upon arrival, the various instructors shall report to the Owner.

3.29 TESTS

- A. Tests must be performed and systems approved prior to painting, covering, insulating, furring or concealing piping.
- B. Provide all test equipment, instrumentations and labor in conjunction with tests.
- C. Prior to test, protect or remove all control devices, air vent and other items, which are not designed to stand pressure used in test.
- D. Accomplish testing of piping in section so as not to leave any pipe or joint untested.
- E. Obtain prior approval for test procedure.
- F. Responsibility for Damages: Contractor shall pay for costs for repair and restoration of work of other trades damaged by tests or cutting done in connection with tests.

3.30 REPAIRS AND RETEST

- A. Refer to related sections.
- B. Make other adjustments, repairs and alterations required to meet specified test results.
- C. Correct defects disclosed by tests or inspection; replace defective parts.
- D. Use only new materials in replacing defective parts; in case of pipe, replace with same length as defective piece.

- E. Repeat tests after defects have been corrected and parts replaced, until pronounced satisfactory.

3.31 MECHANICAL SYSTEMS STARTING

- A. Start-up all operating systems provided under Division 15.
- B. Demonstration of all operating systems provided under Division 15, including, but not limited to:
 - 1. Exhaust Fans
 - 2. Control System
- C. Sequencing: Conduct demonstrations only after systems have been through start-up procedures, systems are complete and operating and operating maintenance data is complete.
- D. Verification of Conditions:
 - 1. Existing conditions: Examine preceding work to ensure that all systems are operational.
 - 2. Verify with Division 16 contractor:
 - a. Temporary services are disconnected and permanent utility services are capable of full load.
 - b. Connections in main switchgear and subpanels are tight.
 - c. Necessary tests and check meter readings have been made.
 - 3. Mechanical:
 - a. Specified tests on piping systems have been made.
 - b. Specified cleaning of piping systems has been completed.
 - c. Piping: Conformance with drawings, specifications, and ANSI B31.1. Replace or correct work rejected because of defects or nonconformance with drawings, specifications and ANSI B31.1.
 - d. Water treatment has been completed.
 - e. Operational and performance tests have been made.
 - f. Each piece of equipment comprising part of system has been checked for proper control sequence, and any other condition which may cause damage to equipment or endanger personnel.
 - g. Verify all exhaust fans operate.
 - h. Verify all plumbing fixtures operate.
 - i. Verify water heater and control operate.
 - j. Verify integrity of all wiring.
 - k. Verify all sensors are provided and in correct location.
 - l. Verify range of each device and check software is compatible sensor calibration.
 - m. Test voltage on each input and output.
 - n. Test start/stop points to verify correct equipment operates.

- o. Verify sequence of operation in all modes.
 - p. Check sensor calibration.
- E. Submit testing plan for review prior to testing. Indicate order of procedure, list items will be tested and order of testing show where all controllers and devices are located.
- F. Provide report indicating all equipment operated properly and as per sequence of operation.

3.32 START-UP TESTING

- A. Notification: Notify owner at least two days in advance of start-up of mechanical systems.
- B. Start-up and Testing: Conduct start-up and start-up testing in presence of owners. See applicable Division 15 Sections for specific requirements.
- C. Lubrication: Field check and field lubricate equipment requiring lubrication prior to initial operation.
- D. Code Authorities: Complete tests required by code authorities including smoke detection, fire protection and health codes.
- E. Control Systems: Ensure control systems are fully operational in manual and automatic modes.
- F. Test equipment before and after installation as applicable where necessary to determine compliance with specifications.
- G. Start-up and Testing: Conduct start-up and start-up testing in presence of Owner. See applicable Division 15 Sections for specific requirements.
- 1. Periodically clean various strainers during initial operation until no further accumulation of foreign materials occurs. Exercise care so minimum loss of water occurs when strainers are cleaned.
 - 2. Adjust safety and automatic control instruments as necessary to place them in proper operation and sequence.
- H. Field Tests: Subject the work of Division 15 to necessary field tests after installation and before acceptance.
- 1. Make proper corrections, repairs and replacements should tests reveal evidence of malfunction. Repeat tests until proper and successful operation is achieved.
 - 2. If final control settings and adjustments cannot be properly made to performance tests because of time of year, make field tests as first seasonal use of systems following completion of project.

- I. Cleaning and Adjusting: After test runs have been completed and systems have been demonstrated to be satisfactory and ready for permanent operation. Clean permanent pipeline strainers properly adjust valve and pump packings, secure drive guards in place, check lubrication and replenish if required.
- J. Protection: If systems are not to continue in use following start-up procedures, take steps to ensure against accidental operation or operation by unauthorized personnel.
- K. Instruct Owner's representatives once on proper operation and maintenance of mechanical systems. Include seasonal concerns and operations.
- L. Systems: All mechanical systems provided under Division 15. See applicable Division 15 Sections for additional requirements.
- M. Contractor's Representatives: Have thorough knowledge of particular installation and system.
- N. Manufacturer's Representatives: Have thorough understanding of each particular equipment and system.
- O. Scheduling: Arrange and schedule demonstration times with Owner.
- P. Location: Conduct demonstrations at Project including tours of systems.
- Q. Operating and Maintenance Date: Arrange for data to be at demonstrations. Include review of data at demonstrations.
- R. Time Allotment: Provide demonstration periods of following minimum time periods:
 - 1. Water Systems: 8 hours (HVAC) for each building.
- S. Control Systems: 8 hours for each building.

3.33 COMPLETION DATE AND TESTING OF MECHANICAL SYSTEMS:

- A. Final Acceptance Tests shall be sufficiently in advance of the contract completion date to permit the execution before that expiration of the contract of any adjustments and/or alterations, which the final acceptance tests indicate as necessary for the proper functioning of all equipment.
 - 1. Any such modifications shall be completed within the number of days allotted for completion of the contract. Retests shall not relieve the Contractor of completion date responsibility.
- B. Starting and Operation: Before starting or operating equipment of systems, make through check to determine that the systems have been flushed and cleaned as required and equipment has been properly installed, lubricated and serviced. Notify owner at least three days in advance of starting these tests.

3.34 PRELIMINARY OPERATIONS

- A. Should the Owner require that any portion of the system or equipment be operated prior to the final completion and acceptance of the work, the Contractor shall furnish such operation. All the expense thereof will be paid by the Owner separate and distinct from any money paid on account of the contract.
- B. For such preliminary operation, payment shall not be construed as final acceptance of any of the work of this contract.

3.35 OPERATING INSTRUCTIONS

- A. The Contractor shall provide the services of a competent Operating Engineer to supervise the operation of all equipment specified herein and to instruct the Owner's operators during a one day operating period. The operating instruction period shall be defined as straight time working hours and shall not include nights and weekends.
- B. The Owner shall be notified in writing at least five days before each operating instruction period begins. The owner must indicate acceptance of the instructional starting time in writing to the Contractor. Upon arrival, the various instructors shall report to the Owner.

3.36 FINAL REVIEW

- A. Date and Time: At a time designated by the Owner, the entire system shall be reviewed by the Architect. The Contractor shall be present at this review.
- B. System Operation: The system shall be operating properly within all water and air volumes balanced and all temperature controls adjusted. All labels shall be removed from the plumbing fixtures, and the fixtures shall be cleaned and in operating condition. Air and Water Balance Report shall be submitted to the Owner.
- C. Documentation: Certificates and documents required herein shall be in order and presented to the Architect at least two weeks prior to the review.
- D. Changes and Corrections: After the review, any changes or corrections noted by the Architect as necessary for the work to comply with these specifications and the drawings shall be accomplished without delay in order to secure final acceptance to the work.

END OF SECTION

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SECTION 23 60 00
HEATING, VENTILATION AND AIR CONDITIONING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Section 23 05 00, "Common Work Results for Mechanical" applies to the work of this Section.
- B. The work listed or required by this section of the specifications is not intended to limit or establish the extent of the Heating, Ventilating and Air Conditioning work. The General Contractor shall be responsible for determining the extent of work to be done under a subcontract.

1.2 DESCRIPTION

- A. Work Included: The work includes the furnishing of all labor, materials, appliances and tools necessary for the installation, in complete working order, of the Heating, Ventilating and Air Conditioning System as herein specified and as indicated on the drawings. The items of work shall include, but shall not be limited to, the following principal items:
 - 1. Equipment including, exhaust fan, etc.
 - 2. Air distribution system, including ductwork, diffusers, registers, dampers, terminal units, etc.
 - 3. Miscellaneous hangers, supports, sleeves, inserts, isolators, flexible connections, seismic bracings, and other auxiliary equipment for all systems under this section.
 - 4. Equipment identification, operations and maintenance instructions.
- B. All apparatus, piping, ductwork, etc. shall be installed and interconnected so as to form complete systems.
- C. Testing, adjustment and balancing of air systems.
- D. Testing, adjustment and balancing of hydronic systems.
- E. Duct leak test of all air systems.
- F. Measurement of final operating condition of HVAC Systems.
- G. Sound measurement of equipment operating conditions.
- H. Vibration measurement of equipment operation conditions.

- I. Provide one four-hour day of instructional time to Owner's maintenance of personnel by Contractor's start-up mechanic.
- J. All other work herein specified and shown on the accompanying drawings, including addendum, change orders and approved shop drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Work designated on drawings to be installed or performed by other sections of the specifications.
- B. Motor starters shall be furnished and installed under Division 16 of the specifications, unless otherwise specified or shown. See equipment paragraphs, this section for packaged equipment to be furnished with starters.
- C. Finish painting of equipment, piping and ductwork shall be under Painting Section, except as noted otherwise.
- D. Equipment foundations, curbs or equipment pads as provided under the Concrete Section or Structural Steel Section. Coordinate exact foundation sizes and elevations and anchor bolt sizes and locations.

1.4 EQUIPMENT RESTRICTIONS

- A. Names of selected manufacturers have been specified for all items of equipment and materials. Bids shall be based on the use of the product of one of the selected manufacturers, and only such products may be submitted for approval.

1.5 SUBMITTALS

- A. In addition to the requirements of Section 23 05 00, the submittal brochures shall include the following items:
 - 1. Air Distribution System:

Duct Sealer	Diffusers
Flexible Connections	Registers
Flexible Duct	Spin-In Fittings
Balancing Dampers	Duct Access Doors
Duct Turns	Right Angle Extractors
 - 2. Equipment:
 - Exhaust Fan
 - 3. Air and Water Balance Report Forms:
 - a. Submit reports on AABC National Standards for Total System Balance or NEBB forms.

b. Forms shall include the following information:

1) Title Page:

- (a) Company name
- (b) Company address
- (c) Company telephone number
- (d) Project Name
- (e) Project Location
- (f) Project Architect
- (g) Project Engineer
- (h) Project Contractor
- (i) Project altitude

2) Instrument List:

- (a) Instrument
- (b) Manufacturer
- (c) Model
- (d) Serial Number
- (e) Range
- (f) Calibration date

3) Air Moving Equipment:

- (a) Location
- (b) Manufacturer
- (c) Model
- (d) Air flow, specified and actual return air flow, specified and actual
- (e) Outside air flow, specified and actual
- (f) Total static pressure (total external), specified and actual
- (g) Inlet pressure
- (h) Discharge pressure
- (i) Fan RPM

4) Exhaust Fan Data:

- (a) Location
- (b) Manufacturer
- (c) Model
- (d) Air flow, specified and actual
- (e) Total static pressure (total external), specified and actual
- (f) Inlet pressure
- (g) Discharge pressure
- (h) Fan RPM

- 5) Exhaust Air Data:
 - (a) Identification/location
 - (b) Design air flow
 - (c) Actual air flow
 - (d) Design return air flow
 - (e) Actual return air flow
 - (f) Design outside air flow
 - (g) Actual outside air flow
 - (h) Supply air temperature
 - (i) Return air temperature
 - (j) Outside air temperature
 - (k) Required mixed air temperature
 - (l) Actual mixed air temperature
 - (m) Design outside/return air ratios
 - (n) Actual outside/return air ratios

- 6) Electric Motors:
 - (a) Manufacturer
 - (b) HP/BHP
 - (c) Phase, voltage, amperage, nameplate, actual, no load
 - (d) RPM
 - (e) Service factor
 - (f) Starter size, rating, heater elements

- 7) V-Belt Drive:
 - (a) Identification/location
 - (b) Required drive RPM
 - (c) Driven sheave, diameter and RPM

- 8) Air Distribution Test Sheet:
 - (a) Air Inlet/Outlet number
 - (b) Room number/location
 - (c) Inlet/Outlet type
 - (d) Inlet/Outlet size
 - (e) Area factor
 - (f) Design velocity
 - (g) Design air flow
 - (h) Test (final) velocity
 - (i) Test (final) air flow
 - (j) Percent of design air flow

9) Sound Level Report:

- (a) Location
- (b) Octave bands – equipment off
- (c) Octave bands – equipment on

10) Duct Leak Test:

- (a) Description of ductwork under test
- (b) Duct design operating pressure
- (c) Duct design test static pressure
- (d) Duct capacity, air flow
- (e) Maximum allowable leakage duct capacity times leak factors
- (f) Test apparatus:
 - i) Blower
 - ii) Orifice, tube size
 - iii) Orifice size
 - iv) Calibrated
- (g) Test static pressure
- (h) Test orifice differential pressure
- (i) Leakage

c. Project Record Documents

- 1) Accurately record actual locations of balancing valves and rough setting.
- 2) Submit location chart.

1.6 VIBRATION ISOLATION

- A. Vibration Isolators: Isolators shall have integral seismic restraints and be selected for minimum static deflection of 1 inch or as otherwise noted and in accordance with the equipment manufacturer's weight distribution so as to produce reasonable uniform deflection. Vibration isolators shall be a system by a manufacturer as listed by the Office of Statewide Health Planning Development (OSHPD); with an anchorage pre-approval R-number.
- B. All mechanical equipment, piping and ductwork shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonable uniform deflections.
- C. All isolators and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.
- D. It is the intent of the seismic portion of this specification to keep all mechanical building system components in place during a seismic event. All such systems must be installed in strict accordance with seismic codes, component manufacturers and building construction

- standards. Whenever a conflict occurs between the manufacturers or construction standards, the most stringent shall apply.
- E. This specification is to be a minimum requirement for seismic consideration and is not intended as a substitute for legislated, more stringent, national, state construction requirements (i.e., California Title 24, California OSHPD) or other requirements.
 - F. A variance or noncompliance with these specification requirements shall be corrected by the Contractor in an approved manner.
 - G. Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.
 - H. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45° to the weakest mode. Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameters, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.
 - I. Provide calculations to determine strain loads resulting from seismic forces presented in CBC 1632. Seismic calculations shall be certified by a licensed engineer, experienced in the design of restraints.
 - J. Housekeeping pads shall be coordinated with a restraint vendor and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.
 - K. Constructor shall supply supplementary support steel for all equipment, piping, ductwork, etc., including the roof-mounted equipment as required.
 - L. Contractor shall supply restraint attachment plates cast into housekeeping pads, concrete inserts, double-sided beam clamps, etc., in accordance with the requirements of the vibration vendor's calculations.
 - M. Failure is defined as the discontinuance of any attachment point between equipment or structure, vertical permanent deformation greater than 1/8 inch and/or horizontal permanent deformation greater than 1/4 inch.

PART 2 - PRODUCTS

2.1 DUCTWORK

A. General

1. All ductwork shown on the drawings, unless otherwise indicated or specified shall be constructed of zinc-coated steel.
2. Minimum 24 gage galvanized steel sheets shall be first quality cold rolled, galvanized, open hearth soft steel sheets, capable of double seaming without fracture, meeting ASTM A525-87.
3. Aluminum sheets shall meet requirements of ASTM B209, 2, 1.4 mil finish.
4. Steel shapes shall be hot rolled, galvanized.
5. Screws and bolts shall be cadmium plated.
6. Materials and construction shall be in accordance with tables listed in SMACNA HVAC Duct Construction Standards and California Code of Regulations (Title 24, Part 4). The most stringent of the SMACNA Standards or the California Code of Regulations, shall be applicable.
7. Pressure: Unless otherwise indicated, all ductwork shall be constructed for 2" pressure class.

B. Materials, Application

1. Pressure: Unless otherwise indicated, all ductwork shall be constructed for 2" pressure class. Materials and construction shall be in accordance with tables listed in SMACNA HVAC Duct Construction Standards and International Code of Regulations. The most stringent of the SMACNA Standards or the International Code of Regulations, shall be applicable.
2. Ducts shall be sealed to SMACNA seal class "A", UL 555. No duct tape shall be permitted.
3. Transverse joints in rectangular ducts may be manufactured type similar to Ductmate Industries, Inc.

C. Circular Ducts

1. Circular (cross section) sheets shall be galvanized steel of spiral seam construction.
2. Joints between two ducts shall be made with beaded sleeve joint having duct sealer applied to joint. Mechanically fasten joints with sheet metal screws or pop rivets.

3. The radius of elbows shall be minimum of 150% of the diameter or maximum width of duct. Gored elbows are not acceptable.
 4. The fittings shall be of conical type change in shape from round to rectangular mode with transformation joint with minimum of 1 to 7 taper.
 5. Corrugated or flexible metal duct circular ducts will not be acceptable.
- D. Spin-In Fittings
1. For all round duct takeoff from a rectangular duct shall be constructed of galvanized steel complete with angled, scoop extractor and spring loaded locking quadrant butterfly damper. Damper shall be a factory installed with spring loaded retractable bearing. Mounting groove shall be a die formed. Install using duct sealer at tap-in to a main duct.
- E. Duct Supports
1. Duct hangers, spacing of hangers, upper and lower attachments, etc. shall conform to the most stringent requirements of the SMACNA or Uniform Mechanical Code. See Part 3.0 for seismic requirements.
 2. Provide additional supports for upper attachments for ductwork utilizing a secondary steel support system consisting of roll-formed channel, "Unistrut" Series P-1002 (back-to-back 1-5/8" X 0.010") roll formed channels) members securely attached between support beams or purlins in accordance with structural engineers approval. Attach duct mounting straps to steel channels using "Unistrut" type spring-loaded, matching nuts and bolts. Furnish additional "Unistrut" channel, clamps, brackets, etc., for complete support of ductwork and diffusers. Do not penetrate a metal duct with any fasteners.
- F. Access Doors
1. Manufacturer based upon Ventfabrics. Equal products by DuroDyne may be submitted for approval.
 2. Non-walk-in access doors for circular ducts shall conform to SMACNA Duct Construction Standards, Figure 2-11 and accompanying description, except other items shall be the same as for rectangular ducts.
 3. Non-walk-in access doors in rectangular sheet metal ducts shall conform to SMACNA Duct Construction Standards, Fig. 2-10, plus accompanying description, except that the following shall be provided:
 - a. Latch: Ventfabrics model 140 with stud long enough to accommodate a door up to 2" thick. Complete with steel and sponge rubber washer.

- b. Hinge: Use two hinges on doors where the hinged edge is less than 24", three hinges on doors where the hinged edge is 24" and over. Doors under 14" x 14" size shall be No. 24 gauge with piano hinge and edge stiffeners.
- c. Door Thickness: All doors shall be double thickness. Provide full thickness of insulation inside door panels in insulated ducts.
- d. Gasketing: The door shall have a compressible gasket seal of incombustible material.
- e. Dimensions: Minimum 12" X 12" in furred spaces and 18" X 18" in equipment rooms.

G. Dampers

1. Manufacturer based upon Pottorff model CD-10 and CD-10R. Equal products by Ruskin or Ventfabrics may be submitted for approval.
2. Manual volume dampers in ducts up to 48" in width shall conform to SMACNA Duct Construction Standards Fig. 2-12 or 2-13 plus its accompanying description except that the following shall be provided:
 - a. The gauge of leaf shall be equal to that of the duct in which the damper is located, except that it shall never be less than 22 gauge. Fasten damper leaves to square rods using damper blade clips. Blade shaft shall be 3/8" square, zinc plated with tight sealing nylon bushings. Damper leaves shall not exceed 8" in width. Use multiple leaves when required. All dampers shall be stiffened where necessary to prevent noise. Any damper causing any noise shall be replaced by new ones or additional stiffeners added so as to eliminate the noise.
3. All steel parts shall be galvanized.
4. For insulated ductwork, the operator arm shall be set on an extension bracket flush with the outside of the insulation. Notch all damper rod ends to indicate position of installed damper blades.
5. All volume dampers above suspended ceilings shall be marked by attaching a 12" length strip of bright yellow cloth to the damper rods.

H. Backdraft Dampers

1. Manufacturer based upon Pottorff model BD64. Equal products by Ruskin or Ventfabrics may be submitted for approval.
2. Backdraft damper shall be low-leakage type with aluminum blades with neoprene blade seals mounted in a 12-gauge minimum steel frame. Bearings shall be oil-impregnated bronze, Teflon or nylon sleeve type. The steel frame shall be a factory finished with a mill galvanized finish.

I. Damper Regulator Hardware

1. Manufacturer based upon Ventfabrics. Equal products by Durodyne may be submitted for approval.
2. For accessible locations in low pressure ducts, provide each leaf with No. 607 end bearing and No. 640 or No. 641 self-locking regulator.

J. Damper Regulator Hardware (Concealed)

1. Manufacturer based upon Young Regulator model 270-301. Equal products by Ventfabrics or Pottorff may be submitted for approval.
2. Damper controller and cable shall be concealed above the ceiling. Cable consists of a Bowden cable 0.054" stainless steel control wire encapsulated in 1/16" flexible galvanized spiral wire sheath. Control kit shall consist of 2-5/8" diameter die cast aluminum housing with 3" diameter zinc plated cover, and 14 gauge steel rack and pinion gear drive converting rotary motion to push-pull motion. Control shaft shall be D-style flattened 1/4" diameter with 265-degree rotation providing graduations for positive locking and control, and 1-1/2" linear travel capacity. Control kit is designed to be imbedded in the ceiling flush with the finished surface. Control kit shall be manual operated using model 030-12 wrench.

K. Flexible Connectors

1. Manufacturer based upon Ventfabrics. Equal products by DuroDyne may be submitted for approval.
2. Provide where called for on drawings and at the ducted discharge and ducted inlet of every fan.
3. Indoor Applications
 - a. Heavy glass fabric with double-coated with polychloroprene with resistance to abrasion and damage from flexing. Complies with UL #214 and NFPA 90A.
 - b. Model Ventglas
4. Outdoor Applications
 - a. Heavy glass fabric with double-coated chlorosulfurated polyethylene. Resistant to sunlight, ozone, and weather. Complies with UL #214 and NFPA 90A.
 - b. Model Ventlon

L. Duct Sealer

1. Manufacturer based upon Casco. Equal products by United Duct Sealer may be submitted for approval.
2. Duct sealer shall be UL Classified, water based, fire resistive, indoor/outdoor, permanently flexible.
3. Duct tape is unacceptable.

M. Instrument Test Holes

1. Manufacturer based upon Ventfabrics model 699. Equal products by Durodyne may be submitted for approval.
2. Test hole shall provide opening for Pitot tubes and other test instruments. The hole is sealed off with a heavy screw cap and gasket. Provide special gasket to adapt test hole to round duct. Height of test hole shall accommodate height of duct insulation.
3. Provide test holes in Air Handling Units supplying 10,000 CFM or greater in both horizontal and vertical positions at the following locations:
 - a. Supply air ducts at each air-handling unit.
 - b. Return air duct at each air-handling unit.
 - c. Fresh air duct at each air-handling unit.
 - d. Exhaust air duct at each exhaust fan.

2.2 DIFFUSERS, REGISTERS, GRILLES

A. Diffusers, Registers, Grilles

1. Manufacturer based upon Krueger. Equal products by Anemostat or Nailor may be submitted for approval.
2. Diffuser, register, and grille sizes are indicated on drawings.

B. Diffusers (Krueger model 1240P):

1. Modular snap-in cores for mounting in 24-inch x 24-inch lay-in tee grid ceiling suspension system or for surface mounting. Steel construction. Provide a round neck adaptor.

C. Return and Exhaust Air Registers (Krueger model 6590):

1. Perforated face type of steel construction. The frame shall be nominal 24" x 24" for mounting in 24" x 24" lay-in tee grid ceiling suspension system. For hard ceilings, provide return and exhaust air registers of neck size.
- D. Sidewall Exhaust Registers (Krueger model S85H):
1. Single deflection return register. Fixed deflectors spaced on 1/2" centers set at 35°. Steel construction. Frame for surface mounting to wall. Provide opposed blade damper.
- E. Submit one sample of each type, tagged for identification to the Architect for approval. Install one of each type and obtain written approval from Architect prior to ordering.
- F. All sheet metal duct collars or plenum boxes for diffusers and registers shall be painted black prior installation of the diffuser and register. Unless otherwise noted, all diffusers and registers shall be furnished with off-white baked enamel finish. After balancing and testing, the Contractor shall refinish all damaged spots and screw heads
- 2.3 EXHUAUST FAN:
- A. General:
1. Fan shall be duct mounted, belt driven centrifugal square inline
- B. Certifications:
1. Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
- C. Construction:
1. The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18 gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gasketing. Pivoting motor plate shall utilize threaded L-bolt design for positive belt tensioning. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.
- D. Wheel:
1. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, *Balance Quality and Vibration Levels for Fans*.

E. Motor:

1. Motor shall be NEMA design B with class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure:

F. Bearings:

1. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a pillow block cast iron housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

G. Belts and Drives:

1. Belts shall be oil and heat resistant, static conducting. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

- H. Manufacturer: Design based on "Loren Cook" utility fans. Equal products by "Greenheck" or "Barry Blower" may be submitted for approval.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. General: Install work as indicated, in accordance with manufacturer's instructions. Locate properly, plumb and level and securely attach to substrate foundations.

3.2 VIBRATION ISOLATORS AND SEISMIC RESTRAINTS

- A. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.
- B. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.
- C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.
- D. The contractor shall not install any equipment, piping, duct or conduit which makes rigid connections with the building unless insulation unless otherwise specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.
- E. Coordinate work with other trades to avoid rigid contact with the building.

- F. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractors expense.
- G. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractors expense.
- H. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractor's expense.
- I. Over stressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:
 - 1. Flanges of structural beams.
 - 2. Upper truss cords in bar joist construction.
 - 3. Cast in place inserts or wedge type drill-in concrete anchors.
- J. Seismic cable restraints as specified under products shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.
- K. Seismic cable assemblies as specified under products are installed taut on non-isolated systems. Seismic solid braces as specified under products may be used in place of cables on rigidly attached systems only.
- L. At locations where seismic restraints are attached to pipe clevis, the clevis cross bolt must be reinforced with pipe clevis bolt braces as specified under products.
- M. Drill in concrete anchors for ceiling and wall installation shall be stud wedge type or female wedge type for floor mounted equipment as specified under products.
- N. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project.
- O. Where piping passes through walls, floors or ceilings, the vibration isolation manufacturer shall provide split wall seals as specified under products.
- P. Air handling equipment and centrifugal fans shall be protected against excessive displacement, which results from high air thrust in relation to the equipment weight. Horizontal thrust restraint shall be as specified under products.
- Q. Locate isolation hangers as near to the overload support structure as possible.

- R. Horizontal pipe isolation: The first three pipe hangers in the main lines near the mechanical equipment shall be M.W. Sausse type HXA-PC. These hangers must also be used in all transverse braced isolation location. Horizontal runs in all other locations throughout the building shall be isolated by hangers M.W. Sausse type HXA. Floor supported piping shall rest on M.W. Sausse type RMLS-EQ. Heat exchanger's and expansion tanks are considered part of the piping run. The first three isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces, the first three hangers shall have minimum 0.75" deflection for pipe sizes up to and including 3", minimum 1-1/2" deflection for pipe sizes up to and including 6" minimum and 2" deflection thereafter. Hangers shall be anchored to the overhead structure. Where piping connects to mechanical equipment, install flexible expansion joints or flexible stainless hoses if flexible expansion joints are not suitable for the service.
- S. Riser isolation: Vertical riser support and restraint system shall consist of M.W. Sausse type "RMS" springs, M.W. Sausse type "PG-EQ" guides, and M.W. Sausse type "VR-EQ" vertical restraints. Install vertical riser guides so that clearances are maintained around concentric pipes in the guides. Steel springs shall be a minimum of 0.75" except in those expansion locations where additional deflection is required to limit load changes to $\pm 25\%$ of the initial load. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.
- T. Seismic Restraint of Piping
1. Seismically restrain all piping listed as a, b, or c below. Use seismic cable restraints if cables are isolated.
 - a. Piping located in boiler rooms, mechanical equipment rooms and refrigeration equipment rooms that is 1-1/4' I.D. and larger.
 - b. All other piping 2-1/2" diameter and larger.
 2. Transverse piping restraints shall be at 40' maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
 3. Longitudinal restraints shall be at 80' maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
 4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.

5. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" of the elbow or TEE or combined stresses are within allowable limits at longer distances.
6. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.
7. Branch lines may not be used to restrain main lines.

U. Vibration Isolation of Ductwork

1. All discharge runs for a distance of 50' from the connected equipment shall be isolated from the building structure by means of spring isolators and spring deflections shall be a minimum of 0.75".
2. All duct runs having air velocity of 1000 fpm or more shall be insulated from the building structure and spring deflection shall be a minimum of 0.75".

V. Seismic Restraint of Duct Work

1. Seismically restrain all ductwork with seismic cable restraints or seismic solid braces for SMACNA seismic hazard level "A" and connection level "Z" as listed below:
 - a. Restrain rectangular ducts with cross sectional are of 6 sq. ft. or larger.
 - b. Restrain round ducts with diameters of 28" or larger.
 - c. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.
2. Transverse restraints shall occur at 30' intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct run and at each end of a duct run.
3. Longitudinal restraints shall occur at 60' intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4' of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
4. The ductwork must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.
5. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.

6. Walls, including gypsum board nonbearing partitions, which have ducts running through them may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.

W. Seismic Restraint Exclusions

1. Duct Work

- a. Rectangular, square or oval ducts less than 6 sq. ft. in cross sectional area.
- b. Round duct less than 28" in diameter.
- c. All duct suspended by hangers 12" or less in length as measured from the top of the duct to the point of attachment to the structure. Hangers must be attached within 2" of the top of the duct with a minimum of two #10 sheet metal screws. If the 12" limit is exceeded by any hanger in the run, seismic bracing is required for the run.

2. Suspended Equipment

- a. VAV boxes and fan powered equipment weighing less than 50 lbs. and rigidly connected to the supply side of the duct system support with a minimum of four hanger rods.

3.3 DUCT SYSTEMS

- A. All ductwork installation shall be coordinated with consultant's drawings, notes and specifications.
- B. Ductwork shall be fabricated to field measurements established by the Contractor on the job. Ducts shall be of sizes and configuration shown on the drawings.
- C. All ducts shall be installed true to line and grade. All horizontal ducts shall be installed tight to structure to leave the greatest possible space under them. Where necessary, changes of elevation in the ducts shall be made to secure this result, but not without approval of the Architect.
- D. Should it be found that any necessary duct dimensions have been omitted from the drawings, Contractor shall notify the Architect, who will supply the dimensions and the Contractor shall then construct the ducts in accordance with these sizes at no extra charge. Should it be found impractical to install any duct of the exact sizes given, a duct of a different shape but having the same resistance shall be installed. The sizes of the substitute duct shall be approved by the Architect.
- E. All transverse seams in duct system shall be SMACNA 7-17 pocket lock standing seam sealed airtight with U.L. listed duct sealer which meets Class 1 requirements of NFPA 90-A, as manufactured by "United", "Duro-Dyne" or approved equal.

- F. Ductwork layout: Follow as close as possible layout indicated on drawings. Secondary beams shall be furnished and installed under this Section of the specifications whenever necessary to meet these requirements.
- G. Swaged joints: Elbows in round ducts may be adjustable type formed by mechanically interlocked swaged joint. Three-piece adjustable elbows may be used for turns up to 45 degrees and five-piece elbows shall be used for turns greater than 45 degrees. Apply duct sealer to swaged joints to seal against air leakage.
- H. Tees and elbows connecting to round spiral ductwork shall have crimped ends for insertion limits. Tee fittings are required for all tee connections in conjunction with spiral ductwork. Cutting of the spiral ductwork for direct connection of a tee branch is prohibited.
- I. Branch duct outlets of tee fittings may be attached using Pittsburgh lock, clinch lock, and/or inside the collar attached with sheet metal screws and continuously caulked with duct sealer.
- J. Connection of round to rectangular ducts: Where more than one round duct connects into a rectangular plenum, spin-in fittings with manual damper or fittings with collars (having manual damper) attached by sheet metal screws may be used. These shall be completely made airtight at the joint by continuous caulking with duct sealer. Provide an adjustable extractor.
- K. Attach crimped and slip-in joints with sheet metal screw and make airtight with continuous caulking with duct sealer.
- L. Flexible round duct connectors: Length of a flexible round duct connector in any branch duct shall not exceed 6', but shall not be less than directed. The installation shall be such that the centerline radius of a bend shall be not less than two diameters. Connections to metal fittings shall be made with sealer and strap clamps. Excess length of the connector shall be cut off and not bunched together, thus impeding a proper air blow. Shall not penetrate any wall without the Architect's approval.
- M. Duct materials: Sides, including bottom and top of all ducts and plenums, shall be constructed of sheet metal. No portion of the building construction, such as walls or slabs, shall be used as part of any duct or plenum unless called for on the drawings or otherwise specified.
- N. Ductwork dimensions: Duct dimensions indicated are inside dimensions for the net free area. If ducts are lined, the duct dimensions indicated are dimensions for the net free area inside the lining and the outer, or overall, dimensions of the actual ducts shall be increased accordingly to accommodate the duct lining specified.
- O. Ductwork installation: Ductwork shall be installed true to line and grade and with seismic restraints in accordance with SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing piping systems. Should it be found impractical to install any duct of the exact sizes given, a duct of a different shape but having the same resistance shall be installed. Ductwork shall be connected to fire/smoke damper sleeves or assemblies in such a way that collapse of the ductwork shall not dislodge the damper or impair its proper operation. In addition to seismic restraints per above standard, duct hanger construction and spacing shall

- be per Uniform Mechanical Code. The most stringent, the SMACNA Guidelines for seismic restraints, Uniform Mechanical Code or the State Mechanical Code, shall be applicable.
- P. Ducts shall not be supported from decking. Furnish and install structural members to span steel purlins to distribute the load. Refer to roof shop drawings for location of beams and purlins for additional structural members for hangers.
- Q. Outlets Installation: Diffusers, registers, and grilles in ceilings and walls shall be located in accordance with Architectural reflected ceiling plans and interior elevation plans whenever such drawings exist. Locations on Mechanical Drawings are only approximate.
- R. Changes in Duct Elevation, unless otherwise shown, fitting shall be made by either of the following:
1. By curved sections of a minimum throat radius equal to the duct dimension in the place of the bend.
 2. By mitered elbows made with double thickness (formed) type turning vanes. Turning vanes in mitered elbows in lined ducts shall be factory manufactured extruded aluminum double thickness (formed) types with acoustical insulation between double wall and shall be approved equal to Sono Turn, manufactured by Sound Control Products Co., Palo Alto, California.
- S. Duct Transition Sections: Changes in the size of ducts shall be made by uniformly tapering sections with a maximum included angle of divergence of 20 degrees for enlargements and a maximum included angle of convergence of 45 degrees for contractions.
- T. Flexible Connections: Provide where indicated on drawings and at the ducted discharge and inlet of every air handling unit, fan-coil unit and fan. Connection shall be waterproof, fire-retardant and flexible.
1. Connection construction: At least 1" slack shall be allowed in flexible connections to insure that no vibration is transmitted from fan to ductwork or plenum. The fabric shall either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage. Equipment shall be arranged and access doors provided as necessary to permit the convenient replacement of the flexible connection after initial installation.
- U. Flashing Duct through Roof: Install flashing to cover top and sides of curb and fit closely around duct. Cover top edge of base flashing with a collar soldered to duct and turned down over base flashing. Fabricate flashing from 24-gauge galvanized steel sheet (minimum).
- V. Manual Volume Dampers:
1. Required in the following locations:
 - a. Where indicated on drawings.

- b. In each supply, return and exhaust duct branch.
 - c. In the main supply duct from an air handling unit. Locate dampers close to unit.
2. Access doors in ducts and plenums:
- a. Required in the following locations:
 - 1) Where indicated on drawings.
 - 2) Where specified herein.
 - 3) Fire damper access door location: At every fire damper, locate an access door to provide convenient accessibility to linkage and fusible link. Unless otherwise called for, access door not required when linkage and fusible link are conveniently accessible through a duct having open ends. Door shall be minimum 14" x 14" where duct size permits.
 - 4) Automatic damper access door location: At every automatic damper, locate an access door to provide convenient accessibility to a damper linkage and damper operator when mounted inside of the duct or plenum. Unless otherwise called for, access door not required when damper linkage and damper operators are conveniently accessible through a duct having open end.
- W. Automatic Dampers: Install automatic dampers called for elsewhere on drawings and in the specifications.
- 3.4 ACCESS TO EQUIPMENT
- A. General:
- 1. All ductwork, equipment, and accessories shall be installed to permit access for maintenance.
 - 2. Any relocation of conduit, piping, equipment, and accessories required to provide maintenance access shall be accomplished by the Contractor at no additional cost to the Owner.
- B. Access:
- 1. Provide access doors where any dampers, instruments, controls, motors and other equipment requiring access for servicing, repairs or replacement are located behind walls, chases, or above non-removable ceilings.
 - 2. The location of access doors shall be coordinated with and installed by the applicable trade installing walls or ceilings.

3. Contractor shall arrange for the necessary openings in the building to allow for admittance of all apparatus.

3.5 AIR INLETS

- A. Any intake duct not protected by a louver, grille, or register shall have a 1/2" mesh-galvanized screen over an open end.
- B. Paint ductwork visible through grilles, registers, and other openings with one coat of flat black paint.

3.6 EXAMINATION AND PREPARATION

- A. Verify that ductwork has been tested for leakage in accordance with SMACNA standards before applying insulation materials.
- B. Verify that all equipment and surfaces are clean, dry and free of foreign material.
- C. Verify piping has been tested as specified.

3.7 DUCTWORK LEAKAGE TEST

- A. Contractor shall conduct leakage test on ductwork. Test shall be performed prior to installing ductwork insulation.
- B. Systems shall be inspected and tested to positive and negative pressures, in accordance with the following:
 1. There are no visible mechanical defects.
 2. There is no audible leakage at any point when area ambient noise is at normal occupancy level.
 3. No leakage is perceptible to the hand, when placed within 6 inches of a joint.
- C. Measured total system leakage shall not exceed 1 percent of total system cubic feet per minute (cfm) when tested in accordance with "LeakTests."
- D. Leak Tests
 1. Test apparatus and procedures shall be similar in all respects to those defined in SMACNA-07. Filtered blower inlet and automatic safety relief device shall be provided to protect system. Accuracy of measurement of leakage flow rate shall be certified to be within 5 percent of total system flow.
- E. Test Apparatus
 1. Test apparatus shall consist of:

- a. A source of high pressure air – a portable rotary blower or tank type vacuum cleaner.
- b. A flow measuring device usually a orifice assembly consisting of straightening vanes and an orifice plate mounted in a straight tube with properly located pressure taps. Each orifice assembly shall be accurately calibrated to its own calibration curve. Pressure and flow readings are usually taken with U-tube manometers.

F. Test Procedures

1. Test for audible leaks as follows:
 - a. Close off and seal openings in the duct section to be tested. Connect the test apparatus to the duct by means of a flexible duct section.
 - b. Start the blower with its control damper closed (some small blowers popularly used for testing ducts may damage the duct because they can develop pressures up to 25 inches wg).
 - c. Gradually open the inlet damper until the pressure reaches 3 inches wg. Test pressure is read on manometer No. 1. Note that the pressure is indicated by the difference in level between the two legs of the manometer and not by the distance from zero to the reading on one leg only.
 - d. Survey joints for audible leaks. Mark each leak and repair after shutting down blower. Do not apply a retest until sealants have set.
2. After all audible leaks have been sealed, the remaining leakage should be measured with the test apparatus orifice section as follows:
 - a. Start blower and open damper until duct pressure reaches 25 percent in excess of designed duct operating pressure.
 - b. Read the pressure differential across the orifice on manometer No. 2. Leakage rate in cfm is read directly from the calibration curve. If leakage does not occur the pressure differential will be zero.
 - c. Total allowable leakage should not exceed 1 percent of the total system design air flow rate. When partial sections of the duct system are tested, the summation of the leakage for all sections shall not exceed the total allowable leakage.
 - d. If all audible leaks have been corrected, it is unlikely that the measured leakage will exceed one percent of capacity. If it does, the leaks shall be located by careful listening or feeling along the joint.
 - e. It should be noted that even though a system may pass the measured leakage test, a concentration of leakage at one point may result in a noisy leak that shall be corrected.

G. Test Report Criteria

1. A test report shall be provided for each system tested, identified by system or section thereof, and containing leak-test curves for apparatus used and data pertinent to acceptance requirements.

3.8 BALANCING

- A. Total system balance shall be performed by an agency approved by the Owner's Representative. All work done by this agency shall be by qualified technicians under the direct supervision of a Certified Test and Balance Engineer.
- B. The responsibility for performing total system balance is "the overall concept requires that one source be responsible for the complete testing, adjusting and balancing of all water and air systems."
 1. Total system balance shall be performed in accordance with the latest edition of the test agency standards in accordance with the scope of work specified in the contract documents.
- C. Total system balance shall not begin until systems are complete.
- D. One agency shall be responsible for all phases of total system balance.
- E. The Test and Balance Agency shall permanently mark the settings of all valves, dampers and other adjustment devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop, it shall be set and locked.
- F. The name of the Test and Balance Agency, plus the name and registration number of the Certified Test and Balance Engineer, shall be submitted to the Owner's Representative for approval within 30 days after the award of the project contract.
- G. The select Test and Balance Agency shall submit to the Owner's Representative:
 1. Detailed procedures
 2. Agenda
 3. Report Forms
 4. Agency Project Performance Guaranty
 5. An approved copy of each of the above must be returned to the Test and Balance Agency before total system balance is begun.
- H. If a complete submittal in accordance with previous paragraphs is not received within the specified time, the Owner's Representative reserves the right to select the Test and Balance Agency.

- I. The Contractor shall provide the Test and Balance Agency with data specified in the standards.
- J. Quality Assurance
 1. Test and balance agency shall be a company specializing in the adjusting and balancing of systems specified in this Section with minimum three years documented experience certified by AABC. Perform work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor registered Professional Engineer.
 2. Total system balance agency shall be a company specializing in the adjusting and balancing of systems specified in this Section with minimum three years documented experience certified by AABC. Perform work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor registered Professional Engineer.
- K. EXAMINATION
 1. Before commencing work, verify that systems are complete and operable. Ensure the following:
 - a. Equipment is operable and in a safe and normal condition.
 - b. Proper thermal overload protection is the place for electrical equipment.
 - c. Duct systems are clean of debris.
 - d. Correct fan rotation.
 - e. Fire and volume dampers are in place and open.
 - f. Access doors are closed and duct end caps are in place.
 - g. Air outlets are installed and connected.
 - h. Duct system leakage has been minimized.
 2. Report any defects or deficiencies noted during performance of services to the Architect/Engineer.
 3. Promptly report abnormal conditions in mechanical systems or conditions, which prevent system balance.
 4. If, for design reasons, system cannot be properly balanced, report as soon as possible.
 5. Beginning of work means acceptance of existing conditions.

L. Preparation

1. Provide instruments required for testing, adjusting and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.
2. Provide additional balancing devices as required.

M. Installation Tolerances

1. Adjust air handling systems to plus or minus 5 percent for supply systems and plus or minus 10 percent for return and exhaust systems from figures indicated.
2. Adjust all zones to plus or minus 5 percent.
3. Adjust more than one diffusers to plus or minus 10 percent.
4. Adjust hydronic systems to plus or minus 10 percent of design conditions indicated.

N. Adjusting

1. Adjust work under provisions of this Section.
2. Recorded data shall represent actually measured or observed condition.
3. Permanently mark settings of valves, dampers and other adjustment devices allowing settings to be restored. Set and lock memory stops.
4. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
5. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes and restoring thermostats to specified settings.
6. At final inspection, recheck random selections of data recorded in the report. Recheck points or areas as selected and witnessed by the Architect.
7. Check and adjust systems approximately six months after final acceptance and submit a report.

O. Air System Procedure

1. Adjust air handling and distribution systems to provide required or design supply, return and exhaust air quantities at site altitude.
2. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
3. Measure air quantities at air inlets and outlets.

4. Adjust distribution system to obtain uniform space temperature free from objectionable drafts and noise.
5. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
6. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
7. Provide system schematic with required and actual air quantities recorded at each outlet and inlet.
8. Measure static air pressure conditions on the air supply units, including filter and coil pressure drops and total pressure across the fan. Make allowances for 50 percent loading of filters.
9. Adjust outside air automatic dampers, outside air, return air and exhaust dampers for design conditions.
10. Measure temperature conditions across outside air, return air and exhaust dampers to check leakage.
11. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling and at a minimum air flow rate, full heating.
12. Measure building static pressure and adjust supply, return and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
13. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, and then modulating.
14. For variable air volume system powered units, set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.9 DUCT CLEANING

- A. Wire brush and vacuum the interior of the air handlers, including the fans and filter racks.
- B. Encapsulate any deteriorating fiberglass air handler liner.
- C. Apply coil cleaner to the cooling coil and comb the dirt from between the fins.
- D. Pressure wash the coils.

- E. Cut access openings in the ductwork as necessary to permit thorough cleaning.
- F. Disconnect the ductwork at the joints.
- G. Hand vacuum and brush the interior of the supply and return ductwork.
- H. Reconnect duct joints.
- I. Cover all access openings with sheet metal panels. Panels will be caulked airtight and screwed in place.
- J. Any exterior duct insulation removed in the process of cleaning will be tacked, taped or glued back in place.
- K. Remove, clean and reinstall the supply and return registers.
- L. Desks, equipment, etc., in all work areas will be covered with clean drop cloths.

3.10 TESTS

A. General:

1. All power, water and fuel required for tests will be furnished as specified under the General Conditions or General Requirements Sections. All other materials, gauges, test thermometers, and all labor necessary shall be furnished by this Contractor.
2. Should any piece of apparatus or any material or work fail in any of these tests, it shall be removed immediately and be replaced by perfect material at the Contractors expense. Any such portions of work so replaced shall be retested. All tests shall be performed in the presence of the Architect.

B. Equipment:

1. After the entire heating, ventilating and air conditioning system installation has been completed, all ducts installed, and all dampers adjusted, etc., a complete test of each air conditioning unit shall be made to determine whether the equipment fulfills the guarantee regarding the quantity of air delivered, efficiency, noiseless operation and other requirements.
2. Contractor shall furnish all labor necessary to adjust the operation of the apparatus and make the connections for the test. Contractor shall replace all fuses blown during the tests. After the tests, restore all connections, apparatus, etc., to their proper condition.
3. Contractor shall demonstrate proper operation of the temperature control system and control system interlocks.
4. Provide Owner with report certifying that all systems are operating properly.

3.11 OPERATION

- A. Operational Readiness: The Contractor shall insure that the complete installation including all equipment and controls, is complete, operating, checked, and adjusted at the time of final inspection. Contractor shall provide one complete extra set of filters, which shall be installed in all units prior to final inspection.
- B. The Contractor shall be held responsible for any delays incurred and/or reinspections required due to any lack of above-mentioned readiness.
- C. Each entire system shall be operated continuously for a period of three full days, at a time requested by the Owner, to prove that the systems will fulfill all guaranteed requirements.

END OF SECTION

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 DESCRIPTION

- A. Principal Work Items are: Provide all labor, material and equipment necessary to complete and test the electrical work as shown on the drawings and as specified herein. Work will include, but not limited to the following:
1. Underground duct banks and pre-cast concrete pull-boxes/manholes, including furnishing hardware and accessories (pulling eyes, drainage, necking, traffic cover, ladder, cable racks, perimeter grounding bus and ground rods) in each pull-box/manhole of the Power and Low Voltage Communication system (for telephone data copper, fiber-optic, low voltage control and Fire Alarm network systems).
 2. A complete electrical grounding system for the building, including electrical service grounding (Ground Rods in ground well, underground and cold water pipe) and Low Voltage Communication system reference ground with a single point of ground connection at the Main Ground Bus.
 3. Supports, duct spacers, clamps, hangers, fastening devices, sleeves, slots, concrete bases, physical protection, caulking, weatherproofing, sealing, closing, etc.
 4. Relocation of utility services (power, fire alarm, fiber optic, tel/data, PV connections and etc.) for the portable buildings and incoming Cox Fiber Optic service which are in the foot-print of the new building in this scope of work. The utility relocation works shall be done prior to grading works starting date.
 5. Complete installation and supply of 480/277 Volt and 208/120Volt, 3-Phase, 4-Wire Switchboard, Distribution Switchboards, feeders, pull-boxes, distribution transformers, control transformers, motor starters, disconnect switches, panel boards, branch circuit conduit and wiring and all other electrical devices.
 6. A complete grounding system for the 480/277 Volt and 208/120Volt derived systems and all of the electrical equipment.
 7. All Luminaires (lighting fixtures), including LED driver, electronic ballasts, lamps, emergency battery pack and occupancy sensor control, day light control, classroom lighting control system, corridor & lobby & exterior lighting control system and other control complete. Including the daylight dimming control system for the specified Tubular Daylight System.
 8. All exterior lighting fixtures including concrete bases for poles /low level area lights, walkway/bollard, step lights and planter lights.
 9. All electrical work for the mechanical system, except as specified to be furnished or installed as part of other Sections in the Specifications.
 10. All distribution materials and connection of the following listed equipment by the specific equipment furnished so that a complete and operable system results:

- a. Building power, communication and fire alarm system connections to Campus systems.
 - b. Electrical operated roll down doors, gates and other type of door operator.
 - c. Electrical operated shades system as applicable.
 - d. Irrigation power connections.
 - e. Audio/Video equipment for classroom.
 - f. Hearing Assistance system.
11. Complete installation of the emergency generator set (self contain an outdoor in Nema 3R enclosure, diesel generator set with sub-base double wall fuel tank), Automatic Transfer Switch with the 480/277 Volt and 208/120Volt distribution system for the Emergency Egress Lighting system and IT equipment and selected emergency outlets designated by the College.
 12. Furnish and install all hangers, anchors, sleeves, chases, access panels and supports required for electrical works.
 13. Electrical conduit system rough-in.
 14. Complete Fire Detection and Alarm system including all control equipment, devices, terminal cabinets, backboards, boxes, conduits, wiring and connections.
 15. Complete system of empty conduit, outlets, back-boxes, cabinets and/or terminal backboards for the security distribution system or other low voltage /signal systems.
 16. Complete system of conduit with voice/data cables, outlets with devices, back-boxes, cabinets and/or terminal backboards with terminating blocks or patch panels for voice/data distribution system.
 17. Excavation, backfill and concrete works required to complete items of this section.
 18. Closing of all openings resulting from coring, sleeving, removal of conduit and/or equipment.
 19. Cleaning, patching, fire stopping/proofing seal, repairing and painting.
 20. Permits and Code Inspection fees.
 21. Prime coat painting of all electrical equipment exposed to view in public area where required and deemed necessary by Architect.
 22. Identified and instruction plates, tags, labels, magnetic yellow tapes, underground warning tapes etc.
 23. Shop drawings and technical data; operating instruction and maintenance manual.
 24. Test of all equipment and system installed.
 25. "As-built" drawings, including but not limited to record of actual routing of duct banks, location of Power Pull-boxes/Manholes and Communication Pull-boxes, lighting and power/communication plan as-built condition.

26. Incidental items not indicated on the drawings nor mentioned in the specifications that belong to the work described, or are required to provide complete systems, as though called out here in every detail.

B. Work in Cooperation with Other Trades:

1. Examine the Drawings and Specifications and determine the work to be performed by the electrical, and other trades. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested, and ready for use. This shall include all conduits, conductor, and all other devices for the required operation and control sequences of all electrical, and other existing systems or equipment.

1.2 QUALITY ASSURANCE

A. Standards:

1. Comply with standards listed in the following:
 - a. Underwriters' Laboratories Inc. (UL).
 - b. The 2013 California Electrical Code, National Electric Code (NEC) 2011 edition, with California Amendments.
 - c. The USA National Fire Code (NFPA).
 - d. The National Electrical Manufacturers' Association (NEMA).
 - e. Institute of Electrical and Electronic Engineers (IEEE).
 - f. American National Standards Institute (ANSI).
 - g. 2013 California Code of regulations, Title 24, Part 1, 2 and 3.
2. Off-Site Work: Conform to Governing Agencies requirements.
3. Earthquake Provisions: All electrical component shall be anchored and braced to meet the force and displacement requirements prescribed in the 2013 CBC, Sections 1613 and ASCE 7-05 Chapter 6 and 13.
4. In case of conflict among the reference standards, the more stringent provisions shall govern and shall be resolved before installation at Contractor's expense. Prepare and secure approval for any clarifying details required by inspection authorities.
5. Nothing in the Contract Documents shall be construed as authority to permit work not conforming to codes, ordinances, standards or regulations.

B. Qualification Of Installers:

1. Throughout the progress of installation of the work of each Section, provide where required as indicated in respective Sections, at least one manufacturer's authorized representative who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills, who

shall be present at the job site and shall direct all work performed under that particular Section.

2. Cutting and patching finish work shall be performed by workmen of the proper trade.

C. Qualification Of Manufacturers:

1. Manufacturers of the products supplied for this project shall have been in the business of manufacturing the particular product for at least five years and be able to prove a history of successful production acceptable to the Architect. As a condition for approval and when directed by the Architect, submit a list of past projects showing a minimum of five projects of similar scope to the Architect for approval.
2. Provide together with the Shop Drawing submittal, where called for in these Specifications, a list of five projects which shall have been in satisfactory operation for the past five years.

1.3 GUARANTEE

- A. Manufacturers Guaranties: Submit guarantees for all applicable equipment and devices.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: See General Conditions, Article titled "Materials".
1. Architect shall be the sole judge of material conformance to Contract Documents. Equal products shall be as selected by the Architect.
 2. All materials and products shall be new and in perfect condition, and of the manufacturer's latest type and model. Unless otherwise noted, each material or product type shall be from one manufacturer only.
 3. All exterior mounted electrical boxes, devices and miscellaneous items shall be tamper-proof assemblies. Where not a standard feature, shop modify assembly to meet this requirement.
 4. Where any devices or equipment is referred to or indicated in these documents or on the Drawings in the singular number, such reference shall be deemed to apply to as many such devices as are required to complete the intended installation as specified and/or as shown on the Drawings.
 5. In case of conflicts among Drawings and Specifications, the more stringent requirement, larger quantities, better qualities and/or more proper application and installation for the particular situation shall govern.
 6. Wherever "finishes" are indicated to be selected by the Architect, such "finishes" shall include all standard as well as optional finishes offered by the Manufacturers.

7. All materials shall be U.L. listed where applicable.

B. Manufacturer and Catalog Numbers:

1. Where manufacturer and catalog numbers are indicated, the published data on the product by the manufacturer are deemed to be part of this specification.
2. Numbers used indicate basic minimum design and appearance required, and must be modified to meet all specific requirements of Contract Documents.
3. Before submitting bid, verify availability of such modification. Where manufacturers cannot meet these modifications, notify Architect 10 days prior to bid date and deem these products removed from approved list of equipment.
4. Act of submitting bid is certification that all equipment specified, with required modifications, is available from at least one manufacturer listed.

2.2 CONDUIT

A. General: Provide only new conduit with UL listing or label and deliver to the site in standard lengths.

B. Types:

1. Rigid Steel Conduit and Couplings: Hot-dipped galvanized or sherardized inside and out, with galvanized threads. Electro-galvanizing is not acceptable. Provide insulated throat metallic bushings.
2. Electric Metallic Steel Tubing: Hot-dipped galvanized or sherardized inside and out, with galvanized threads. Electro-galvanizing is not acceptable. Provide insulated and bushed tap-on type connectors and couplings as made by Tomic or T&B, or wrench-tightened compression type couplings. Set-screw type couplings or connectors are not acceptable.
3. Flexible Conduit: Manufacture from single strip steel, hot-dip galvanized on all four sides prior to conduit fabrication. Provide insulated die-cast connectors with ridges that thread into the inside of the conduit to ensure a force fit as made by T&B or approved equal. Binding-screw type connectors are not acceptable.
4. Liquid-Tight Flexible Conduit: Identical to flexible steel conduit but with overall polyvinyl chloride plastic jacket. Provide insulating connectors, Appleton STN series, or approved equal.
5. Rigid Plastic Conduit: Extrude from virgin polyvinyl chloride compound, Schedule 40 heavy wall, in 10'-0" (3 m) lengths with couplings. Where threaded connection is required or for allowed exposed application where subject to physical damage provide Schedule 80 conduit.

2.3 GROUND WELL AND GROUND ELECTRODE

A. Ground Well

1. Ground well shall be of the pre-cast concrete type with armored body and cast iron lid. Inside dimensions shall be 10" (254 mm) diameter by 12" (305 mm) deep.
2. Provide permanent marking on top of lid identifying as "GROUND WELL".

B. Ground Electrode:

1. Install a grounding electrode constructed of 3/4" (20 mm) diameter by 10 feet (3 m) long copper-weld rod driven vertically full length into the ground through the ground well.
2. Fill the inside of the ground well with a layer of fine sand and layer of crushed rock on top with the ground rod protruding approximately 3" (76 mm) above the two layers.

C. Acceptable Manufacturers: Provide Brooks Product No. 3RT or approved equal by Quick set for the Ground Well and J.A. Weaver W-3410 for the grounding electrode

2.4 WORKMANSHIP

A. General:

1. All materials and equipment shall be installed in accordance with approved recommendations of the manufacturer and conforming to the Contract Documents. All devices and equipment are laid out per requirements of one manufacturer. Modify work and arrangements to suit actual equipment installed and pay for all additional cost incurred, if any. The installation shall conform to the applicable codes, rules, and regulations. The Drawings indicate, in diagrammatic form, the work to be done rather than exact routing, location and arrangement of equipment, conduit, and wiring. Make use of data in Contract Documents, verify against developed field conditions, install work in an orderly arrangement in a manner to overcome structural and other interference.
2. Study all Drawings and properly locate the outlets and equipment so that they are readily accessible. Locate equipment and outlets to avoid interference with mechanical or structural features. Do not support any electrical material, equipment or device from sheet metal roof decks or ductworks. If any conflicts occur necessitating departures from the Drawings, details of such departures and reasons therefore shall be submitted as soon as practicable for written approval.
3. Where developed conditions make revisions necessary to indicated locations and arrangements, Contractor shall make changes, at no additional cost, provided:
 - a. Change is ordered prior to time conduit is installed.
 - b. Length of conduit run is not changed more than 10-percent.
4. Architectural and structural drawings take precedence over electrical drawings in representation of general construction work, and drawings of various trades take

precedence in representation of work of these trades. Refer to all Contract Documents and coordinate electrical work with other work.

5. Where discrepancies arise among the various Contract Documents, stop work in affected areas. Promptly notify Inspector of conditions.
6. Galvanic and chemical corrosion shall be prevented by isolating dissimilar metals and preventing contact of aluminum with concrete, plaster, mortar or earth.
7. All equipment shall be braced and/or anchored to meet the force and displacement requirements prescribed in the 2010 CBC, Sections 1615A.1.12 through 1615A.1.22 and ASCE 7-05 Chapter 6 and 13.
8. The Structural Engineer of Record shall verify the adequacy of the structure to support the hanger and brace loads

END OF SECTION

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SECTION 260553 - IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification for conductors and communication and control cable.
 - 2. Warning labels and signs.
 - 3. Equipment identification labels.

PART 2 PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches. Metal-Backed, Butyrate Warning Signs: Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
- D. Fasteners for Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.
- E. Warning label and sign 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. Dimension in first subparagraph below is clear space prescribed in NFPA 70 (2002 Edition), Table 110-26(A)(1), for equipment with nominal voltage to ground of 151 to 600 V, and with grounded parts, including concrete, brick, or tile walls, opposite the equipment. Additional clear space is required at this voltage if there

are unguarded exposed live parts on both sides of the workspace. Retain below and revise to suit Project conditions or requirements of authorities having jurisdiction, or indicate varying clearance requirements on Drawings.

3. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR MINIMUM 36 INCHES WIDE PARALEL TO EQUIPMENT & DEPTH AS REQUIRED BY NEC ARTICLE 110.32."
4. Equipment containing or operating circuits more than 240Volts nominal: Provide laminated plastic warning signs engraved in 1/2" high by 3/8" wide white letters on red background to read: "CAUTION HIGH VOLTAGE-'XXX' VOLT" , 'XXX' indicating actual voltage.
5. Provide Arc Flash Name plate with PPE category information on each electrical equipment, which are likely require examination, adjustment, servicing, or maintenance while energized, including but not limited to Switchgear, Switchboards, Transformers, Industrial Control Panels, Motor Control Centers, Disconnect Switches and Panels. PPE level shall be in accordance with the Arc Flash Hazard Analysis report done on the Short Circuit and Over-current Protective Device Coordination study

2.3 EQUIPMENT IDENTIFICATION LABELS

- A. Provide laminated plastic warning signs engraved in 1/2" high by 3/8" wide white letters on red background to Provide laminated plastic warning signs engraved in 1/2" high by 3/8" wide white letters on red background to Provide laminated plastic warning signs engraved in 1/2" high by 3/8" wide white letters on red background to Retain one of two paragraphs below to specify type of labels Contractor must use to comply with NFPA 70 (2011 Edition), Article 110-22, "Identification of Disconnecting Means." Note that, unless otherwise indicated, the labeling products selected below will also be used for labeling that is not required by NFPA 70 but may be specified in Part 3 "Application" Article to identify equipment other than disconnect devices. See Evaluations.
- B. Provide three layers laminated plastic (micarta) nameplates engraved in 1/4" (minimum) high black letters on white background to correspond with the designations on the Drawings, electrical equipment nameplate shall be as follows:
- C. The main nameplate shall give the equipment designation in 1/2" high letters, the second line in 1/4" high letters shall indicate the Amperage, Voltage-Phase, and Wire. The third line of same dimensions as the second line shall indicate where the equipment fed from. Following is an example of Panelboard nameplate:

PANEL "1HA"
100AMP MAIN, 480Y/277-VOLT, 3-PH, 4W
FED FM "1MS" – 100A CB
- D. Provide red letters on white background for emergency equipment.

PART 3 EXECUTION

3.1 APPLICATION

- A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
 2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply metal-backed, butyrate warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
1. 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.
 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- C. Coordinate paragraph and subparagraphs below with electrical Sections in Divisions 26, 27, and 28. Delete items not in Project.
- D. Equipment Identification Labels (name plates): On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Provide laminated plastic nameplates engraved in black letters on white background (for emergency power equipment, provide white letters on red background), attached with rivets or self tapping screws or with nuts and flat and lock washers.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
 - c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.

- d. Provide engraved branch circuit breaker numbering strip, screw or riveted on branch circuit and lighting panelboard internal trim. Permanent engraved numbering on internal trim is acceptable, sticker numbering system is not permitted.
 - e. Provide load schedules for all branch circuit and lighting panelboards, identifying type, size and location of load. Schedules shall be typewritten and protected by transparent plastic cover.
2. Equipment to be Labeled:
- a. Identification labeling of some items listed below may be required by individual Sections or by NFPA 70.
 - b. Panelboards, electrical cabinets, and enclosures.
 - c. Electrical switchgear and switchboards.
 - d. Transformers.
 - e. Substations.
 - f. Generators.
 - g. Motor-control centers.
 - h. Disconnect switches.
 - i. Enclosed circuit breakers.
 - j. Motor starters.
 - k. Push-button stations.
 - l. Power transfer equipment/MV Switches.
 - m. Contactors.
 - n. Pull boxes.
 - o. Terminal Cabinet

END OF SECTION

SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY/ARC FLASH HAZARD ANALYSIS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes short circuit and protective device coordination study encompassing portions of electrical distribution system from normal power source or sources up to and including breakers in service entrance switchboard, fuses in service entrance switchboard, main breaker in sub-distribution panels, fuses in sub-distribution panels and main breaker in each panelboard.
1. The contractor shall furnish short circuit and protective device study prepared by electrical equipment manufacturer for the protective devices to be installed under this project to assure proper equipment and personnel protection.
 2. The study shall present an organized time-current analysis of each protective device in series from individual device back to the normal power source.
 3. The study shall include an Arc Flash Hazard Analysis Study per the requirements set forth in NFPA 70E – Standard for Electrical Safety in the Workplace. The Arc Flash Hazard Analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
1. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings (Gray Book).
 2. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book).
 3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis (Brown Book).
 4. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
 5. IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations.
- B. American National Standard Institute (ANSI):
1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
 2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures.
 3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis

4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.
- C. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.
 2. NFPA 70E – Standard for Electrical Safety in the Workplace.

1.3 DESIGN REQUIREMENTS

- A. Complete Short Circuit and Protective Device Coordination Study to meet requirements of NFPA 70.
- B. Complete an Arc Flash Hazard Analysis Study per the requirements set forth in NFPA 70E – Standard for Electrical Safety in the Workplace. The Arc Flash Hazard Analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
- C. Report Preparation:
1. Prepare study prior to ordering distribution equipment to verify equipment ratings required.
 2. Perform study with aid of computer software program.
 3. Obtain actual settings for packaged chiller and motor characteristics and for equipment incorporated into Work.
 4. Calculate short circuit interrupting and, when applicable, momentary duties for assumed 3-phase bolted fault short circuit current and phase to ground fault short circuit current at each of the following:
 - a. Electrical Utility supply termination point.
 - b. Automatic transfer switch.
 - c. Engine generator.
 - d. Main Service Switchboard.
 - e. Distribution panelboards.
 - f. Branch circuit panelboards.
 - g. Each other significant equipment location throughout system.
- D. Report Contents:
1. Include the following:
 - a. Executive Summary.
 - b. Descriptions, purpose, basis and scope of study.

- c. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties.
- d. Protective device time versus current coordination curves, tabulation of relay and circuit breaker trip unit settings and fuse selection.
- e. Fault current calculations including definition of terms and guide for interpretation of the computer printout.
- f. Details of incident energy and flash protection boundary calculations.
- g. One-line diagram revised by adding actual instantaneous short circuits available.
- h. State conclusions and recommendations for system improvements, where needed.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with IEEE 242 and IEEE 1584.
- B. Studies shall be performed using the latest revision of the SKM System Analysis Power Tools for Windows (PTW) software program. Submit for review information on alternative equal software proposed to be used in performing study.
- C. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Study Preparer: Electrical equipment manufacturer Engineering Services specializing in performing work of this section with minimum five years documented experience and having completed projects of similar size and complexity within the past years.
- B. Perform study under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location in State of with minimum of five years experience in power system analysis.
- C. The Registered Professional Electrical Engineer shall be a full time employee of the equipment manufacturer or an approved engineering firm by the equipment manufacturer.
- D. The equipment manufacturer or approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual Arc Flash Hazard Analysis it has performed in the past year.
- E. Demonstrate company performing study has capability and experience to provide assistance during system start up.

PART 2 PRODUCTS

2.1 STUDIES

- A. Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer engineering services department.
- B. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D.
- C. Provide related Equipment Warning labels and Signs under "IDENTIFICATION OF ELECTRICAL SYSTEMS" Section.

2.2 DATA COLLECTION

- A. Contractor shall furnish all data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- B. Source combination may include present and future motors and generators.
- C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.
- D. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

- A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141-1993.
- B. Transformer design impedances shall be used when test impedances are not available.
- C. Provide the following:
 - 1. Calculation methods and assumptions
 - 2. Selected base per unit quantities
 - 3. One-line diagram of the system being evaluated
 - 4. Source impedance data, including electric utility system and motor fault contribution characteristics
 - 5. Tabulations of calculated quantities
 - 6. Results, conclusions, and recommendations.

- D. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
 - 1. Electric utility's supply termination point
 - 2. Main Service Switchboard.
 - 3. Motor control centers
 - 4. Standby generator and automatic transfer switch
 - 5. Branch circuit panelboards
 - 6. Other significant locations throughout the system.
- E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.
- F. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short circuit ratings
 - 2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
 - 3. Notify Owner in writing, of existing, circuit protective devices improperly rated for the calculated available fault current.

2.4 PROTECTIVE DEVICE COORDINATION STUDY.

- A. Proposed protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.
- B. Include on each TCC graph, a complete title and one-line diagram with legend identifying the specific portion of the system covered.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
- D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the TCC graphs, where applicable:
 - 1. Electric utility's overcurrent protective device
 - 2. Medium voltage equipment overcurrent relays
 - 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
 - 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands

5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
 6. Conductor damage curves
 7. Ground fault protective devices, as applicable
 8. Pertinent motor starting characteristics and motor damage points, where applicable
 9. Pertinent generator short-circuit decrement curve and generator damage point
 10. The largest feeder circuit breaker in each motor control center and applicable panelboard.
- F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.5 ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
- B. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- C. The Arc-Flash Hazard Analysis shall include all significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA where work could be performed on energized parts.
- D. Safe working distances shall be based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².
- E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations
- F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.

- G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:
 - 1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.
 - 2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).
- H. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.
- I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.
- J. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.
- K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Provide assistance to electrical distribution system equipment manufacturer during start up of electrical system and equipment.
- B. Select each primary protective device for delta-wye connected transformer so device's characteristic or operating band is within transformer characteristics, including point equal to 58 percent of ANSI withstand point to provide secondary line-to-ground fault protection.
- C. Separate transformer primary protective device characteristic curves from associated secondary device characteristics by 16 percent current margin to provide proper coordination and protection in event of secondary line-to-line faults.

- D. Separate medium-voltage relay characteristic curves from curves for other devices by at least 0.4 second time margin.

3.2 ADJUSTING

- A. Perform field adjustments of protective devices and modifications to equipment to place equipment in final operating condition. Adjust relay and protective device settings in accordance with recommended settings table on the approved short circuit and protective device coordination study.

3.3 ARC FLASH WARNING LABELS

- A. The contractor of the Arc Flash Hazard Analysis shall provide a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. All labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the owner and after any system changes, upgrades or modifications have been incorporated in the system.
- C. Arc Flash Label must contain important elements as required in the NFPA 70 and NFPA 70E, and further detailed in Section 260553.
- D. Labels shall be machine printed, with no field markings.
- E. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.
 - 1. For each 600, 480 and applicable 208 volt panelboard, one arc flash label shall be provided.
 - 2. For each low voltage switchboard, one arc flash label shall be provided.

END OF SECTION

SECTION 262400 - BUILDING SERVICE & DISTRIBUTION

PART 1 STANDARDS

1.1 DESCRIPTION

- A. Work Included: Provide all labor, material, equipment, necessary testing, and complete the building service and distribution system as shown on the Drawings and as specified herein.

PART 2 MATERIALS

2.1 CONCRETE PULL BOXES

- A. General:
1. Provide precast concrete pull boxes where pull boxes are indicated complete with cover, drain hole and two pull irons. Unless otherwise indicated, inside dimensions for pull boxes shall be 2'-6" (0.762 m) wide by 4' (1.22 m) long by 4' (1.22 m) deep.
 2. Pull boxes shall meet all legal requirements as to size for conduits terminating therein.
 3. Reinforced concrete shall be Class A, 20,684 kPa (3,000 psi) type.
- B. Covers:
1. Covers shall be concrete with a cast-iron lid and frame.
 2. Cast-iron lid shall have bead weld designation; "ELECTRICAL", "HIGH-VOLTAGE", "COMMUNICATIONS", "FIBER-OPTIC" and etc., as required. Submit to the Architect for review.
 3. Provide traffic-type construction with traffic covers in areas involving vehicular traffic.
- C. Acceptable Manufacturers: Pre-cast concrete pull boxes shall be Quikset EPB-2100 Series or equal by Brooks Products, Jensen or Oldcastle.

2.2 UNDERGROUND CONDUIT SYSTEM

- A. Underground Conduit System: Provide as shown on the Drawings and as specified.
- B. Excavation: Provide excavation for underground conduit system and manholes as shown on the Drawings and as specified hereinbefore.
- C. Conduit for the underground conduit system shall be as shown on the Drawings, and as specified in Section 260500 and in Part Three of this Section.

- D. The conduit length for each size shall be the length that is standard with the manufacturer with a permissible tolerance of 1/4" (0.6 cm) in a 10'-0" (3.1 m) length.
- E. Conduit fittings shall be UL approved and shall conform to applicable standards, except that where NEMA Standards for conduit fittings do not exist, fittings shall be as recommended by the conduit manufacturer.
- F. Conduit fittings shall be of a type especially made for use with the conduit for electrical service. Plastic conduit and fittings shall be capable of being joined, by means of a solvent welding cement, so as to provide a watertight root-proof joint.

2.3 CABLES

- A. General: Provide all cables as indicated and specified.
- B. 600-Volt Class and Under: Provide conductors of the 600-Volt class and under as specified under paragraph, "Wire and Cable", in Section 26 05 00.
- C. Over 600-Volt Class: Refer to Section 26 13 00.
- D. Auxiliary Systems: Provide clock, voice/data, security, fire alarm or other auxiliary type system cables as specified under the respective sections.

2.4 INTEGRATED POWER CENTER

- A. General
 - 1. Integrated power center (IPC) combine power distribution and controls into one integrated package.
 - 2. The IPC structure is 84 inches high x10-9/32 inches deep load conductors exit the top or bottom of the IPC.
 - 3. The IPC consist combination of 480Y/277V, 3phase, 4 wire main circuit breaker panelboard, three-phase 480 Delta – 208Y/120V, 3 phase distribution transformer assembly and 208Y/120V-3phase, 4 wire panelboard.
 - 4. The integrated power center equipment rating are indicated in the single line diagram.
- B. Standard
 - 1. The integrated power center shall be manufactured and tested to meet the following standards: U.L. 50, U.L. 67, U.L. 98, U.L. 489, U.L. 891, NEMA AB1, NEMA PB1, NEMA PB2, NEMA 250, NEC Art 384, NFPA 70.
 - 2. The integrated power center and the devices within shall be manufactured and tested to meet the following federal specifications: W-C 375B/Gen, W-C 865C, WP 115B Type 1, Class 1.

- C. Enclosure
 - 1. The IPC enclosure shall be NEMA3R floor standing in 4" concrete pad grounded in accordance with NEC for system and equipment ground.
 - 2. Enclosure shall be steel construction in accordance to applicable U.L. standards.
- D. Main circuit breakers
 - 1. Main circuit breakers rating and short circuit duty are as indicated.
 - 2. Refer to standard for compliance.
- E. Transformer
 - 1. Three phase, 480 Delta – 208Y/120V. KVA as indicated.
 - 2. H-220C insulation system with 80°C. rise above 40°C ambient.
 - 3. Provision for close coupling to integrated power center line-up.
 - 4. Copper winding.
 - 5. Green premium (RoHS/Reach Compliance product environmental profile)
 - 6. Electrostatic shield.
 - 7. UL listed to UL1561 under file E6868.
 - 8. Complying with 10 CFR 431 (78 FR 2335 – April 18, 2013)
- F. Power Panelboard
 - 1. 208Y/120V. 3-phase 4-wire, with main circuit breaker.
 - 2. Refer to single line diagram for trip and frame size.
 - 3. Refer to standard Panelboards Section below for compliance.
- G. Integrated System
 - 1. Power panelboards shall be installed in common-depth and front-accessible switchboard enclosures.
 - 2. Factory installed power cables shall electrically connect main breaker, transformer and panelboard in the line-up.
- H. Fronts
 - 1. Trim front shall meet strength and rigidity requirements or applicable U.L. standards.
 - 2. Each section shall have a hinged door with a three-point latch with locking provisions.
 - 3. A clear plastic directory card holder shall be mounted on the inside of the door.
 - 4. Locks shall be cylindrical tumbler type. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock.

- I. Acceptable manufacturers: Integrated power center shall be Square D, Eaton or General Electric.

2.5 TRANSFORMERS (600-VOLT CLASS AND BELOW)

- A. General: Provide transformers for use on 60-Hertz system with the following characteristics:
 1. Type: Dry, ventilated, self-cooled type with provisions for future cooling fans where indicated.
 2. Complying with 10 CFR 431 (78 FR 2335 – April 18, 2013)
 3. Ratings: Phase, Voltage and connection arrangement as indicated.
 4. Capacities: The kVA capacities as indicated with capability of carrying a continuous 10-percent overload at rated Voltage without exceeding NEMA average and hot spot temperature ratings of the insulation at 104-degree F (40-degree C) ambient air temperature.
 5. Windings: Constructed of copper and shall be of the fire-resistant type, designed for natural convection cooling through normal air circulation.
 6. Insulation: Suitable for 80-degree C average conductor temperature rise.
 7. Dimensions: Within the limitations indicated or the space available for installing the transformers.
 8. Taps: Four 2-1/2 percent primary taps, 2 above and 2 below rated Voltage.
 9. Terminals: Locate terminals at the bottom of the transformer or other area where the temperature, when operating at 10-percent overload and in an ambient of 104-degree F (40-degree C) will not exceed 140-degree F (60-degree C).
 10. Mounting: Floor, wall or ceiling mounted, as indicated. Transformers shall be furnished complete with mounting channels and mounting bolts. Enclosures shall be provided with lifting lugs and jacking plates as required.
 11. Vibration Dampening: Constructed with built in vibration dampeners which completely isolate the cores and coils from all supports and enclosures.
 12. Sound Ratings: In the installed condition, the sound levels shall not exceed:
 - a. 45 dB for 0 to 45 kVA.
 - b. 50 dB for 46 to 150 kVA.
 - c. 55 dB for 151 to 300 kVA.
 - d. 60 dB for 301 to 500 kVA.
 13. Enclosure: Cover plates shall be Code-gauge sheet steel, captive type, bolted to the enclosure framework. Enclosure shall have suitable ventilating openings with rodent-proof screens. Provide weatherproof type when located outdoors.
 14. Finish: Metal parts excepting cores or core mounting frames shall be cleaned, rust-proofed, and be given a heavy coating of an inert primer. Cover plates and

external metal parts shall be finished with two full-bodied coatings of oil-resistant industrial gray enamel.

15. Nameplates: Provide nameplates, identifying the characteristics, as specified in Section 260553.

- B. Acceptable Manufacturers: Transformers shall be manufactured by Square D; Eaton or General Electric.

2.6 PANELBOARDS

A. General:

1. Provide flush or surface mounted panelboards with main breakers or lugs, sub-fed lugs, bus size and circuit breakers of a rating as shown on the Drawings.
2. Each branch circuit breaker shall be identified by permanent number identification as to circuit numbers. Adhesive sticker numbering identification system is not acceptable.
3. Panelboard shall have "field marked" to warn qualified persons of the potential for arc-flash hazards.
4. Top of panelboard shall not be higher than 78" (198 cm) above finished floor.
5. Space for controls such as time clocks, time controlled relays and air-conditioning controls shall be located in a separate compartment with hinged doors within respective panelboards. Where limited by the height of the panels, locate controls in a separate cabinet adjacent to the respective panelboard.

- B. Bus bars shall be rectangular in cross-section constructed of copper with silver-plated joints and interconnections. Unless otherwise indicated, neutral buses shall be full size. Bus bars shall be isolated from wiring troughs and working spaces and be braced to withstand a minimum short circuit fault of 25,000 Ampere RMS symmetrical or larger as indicated. Provide split bus where indicated on the Drawings.

C. Circuit Breakers:

1. Circuit breakers shall have interrupting capacities as indicated on the Drawings. Minimum interrupting capacities for 120/208 and 277/480-Volt circuit breakers shall be 10,000 Ampere and 14,000 Ampere RMS symmetrical respectively. Provide breakers of the bolt-on molded case type. Plug-in types are not acceptable.
2. Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multi-pole circuit breakers shall be of the common-trip type having a single operating handle and for sizes of 50 Ampere or less, may consist of single-pole circuit breakers permanently assembled at the factory into a multi-pole unit.
3. Circuit breakers used for motor-circuit disconnects and not in sight of the motor controller shall be capable of being locked in the open position.

4. All circuit breakers shall have provisions for lock out clips which shall be provided for breakers serving motors, signal systems and air-conditioning controls, and as indicated on the schedules on the Drawings.
 5. Provide approved "Lock-Off" devices for all circuit breakers serving lighting circuits without local switching.
 6. Circuit breakers shall be arranged in the panels to correspond exactly with the schedules on the Drawings. Circuit numbers shall be black-on-white plastic tabs or other such permanent type which cannot be changed readily from the front of the panel.
 7. Breakers serving loads comprised of large wattage incandescent lamps shall be equipped with desensitized magnetic trip mechanisms which prevent tripping by in-rush currents.
 8. Provide approved handle ties for individual circuit breakers protecting each ungrounded branch circuit conductor of multi-wire branch circuits.
 9. Provide ground fault circuit-interrupter for all Code required lighting or receptacle circuits rated at 15, 20, 25 or 30 Ampere at 120 Volts or above. The bolt-on molded-case type circuit breaker, similar to General Electric Type THQB-GF, shall be of the quick-make, quick-break operating mechanism with construction as described above and with the following additional features:
 - a. Ampere line-to-line, ground fault conditions: 0.005.
 - b. Ampere, symmetrical rms at 120 Volts: 10,000.
 - c. Push-to-test circuit.
 - d. Trip-free handle to allow breaker to trip even if handle is held or blocked in the "ON" position.
 - e. If the above requirements cannot be met, the following shall be provided:
 - 1) Provide ground fault circuit-interrupter for all Code required circuits. Ground-fault protection shall consist of a ground-sensor encircling all phase conductors, connected to a solid-state ground relay which initiates tripping of the circuit breaker.
 - 2) Ground protection shall be adjustable from 5 to 50 Ampere. Circuit-interrupter shunt-trip and relay shall operate from a 120-Volt control source. Time-current characteristic shall provide 0.1-second operation at about 10 times pickup. Relay shall be surface mounted in a separate barriered space.
- D. Control Devices: Contactors, relays, time switches and related equipment shall be as specified in Section 260500 and shall be mounted in a separate barriered space. Refer to the paragraph, "Cabinets", herein.

E. Cabinets:

1. Back boxes shall be flush or surface mounted as shown on the Drawings. Construction shall be of Code gauge zinc-coated sheet steel bearing the UL label where required. Back boxes shall be galvanized when recess mounted. Refer to "Painting" section for finish requirement of galvanized surfaces.
2. Panelboards shall be minimum 20" (51 cm) wide and shall be of types as required by the schedules and these Specifications. Where specifically indicated on the Drawings, provide UL listed column-type panelboards. All other requirements of the column-type panelboard shall comply with those specified in this section.
3. Panelboard doors shall be hinged and have pin tumbler cylinder locks operated by paracentric type keys. All panelboard locks shall be common keyed. Furnish two keys for each panelboard.
4. Where more than one door is mounted on a panelboard, arrange the trim so that a minimum 2" (5.1 cm) solid metal trim space is maintained between doors. Doors and trims shall be minimum 12 gauge steel.
5. Provide 12" (30.5 cm) high gutter where double lugs are required or where cable size exceeds bus size.
6. Wiring gutters on panelboards having through feeders shall be 5" (12.7 cm) minimum. Gutters shall be an integral part of the panelboard.
7. Provide barriered space for mounting contactors and control devices with a hinged door and lock, where shown or required.

F. Finish: Doors, trims and surface mounted back boxes located in areas exposed to public view shall be painted with one coat zinc chromate and one coat of primer sealer. Finish painting shall be in accordance with section, "Painting". Provide doors, trims and surface mounted back boxes located in custodian's rooms, mechanical rooms, electrical rooms and other areas not exposed to public view with one coat zinc chromate and a hammertone or light gray baked enamel finish.

G. Identification:

1. Provide neatly typed circuit index cards, clearly and correctly identifying all circuits, mounted in card holders, behind glass or heavy plastic on the inside of the panelboard doors. Indexes shall accurately record room numbers and load of each circuit.
2. Provide nameplates as specified under paragraph, "Nameplates", in Section 26 05 00. Designate the identifying nomenclature, Voltage and phase of the panel as shown on the Drawings, for example:

PANEL "1LB"
100 A MAIN – 208Y/120 V, 3 PH, 4W
FED FM "1DSL" – 100A CB

- H. Acceptable Manufacturers: Panelboard assembly, devices and major components shall be of the same manufacturer. Acceptable manufacturers are Square D; Eaton or General Electric.

2.7 DISTRIBUTION SWITCHBOARDS

A. General:

1. Provide distribution switchboards with ratings, components and features as indicated on the Drawings.
2. Switchboards shall consist of molded case thermal magnetic circuit breakers or externally operable quick-make, quick-break fused switch as indicated on the Drawings, in floor-standing, dead front, totally metal enclosed sections requiring front access only.
3. All sections shall be nominal 90" (22.9 cm) high, 15" (38.1 cm) deep and 38" (0.965 m) or 42" (1.067 m) wide and shall not exceed the physical spaces allowed for on the Drawings. Switchboards shall be constructed of Code gauge sheet steel.
4. In outdoor locations or where indicated, provide weatherproof enclosure having doors with padlocking facilities.

B. Bus bars:

1. Bus bars shall be rectangular in cross-section, constructed of copper with silver-plated joints and full-height in each vertical section with horizontal cross bus bars between sections. Short circuit bracing capabilities shall be in accordance with the minimum requirement as indicated for the circuit breakers.
2. Provide all lugs for sizes No. 6 AWG or larger suitable for copper conductors. Shop drawings must show lug sizes based on the actual conductors to be provided.
3. Neutral bar shall have terminals for all active, spare or inactive circuits.

C. Disconnect Devices:

1. Circuit breakers shall be of the bolted-on molded case type, with thermal magnetic trips and shall be rated at the Voltage with frame sizes, number of poles, and trip settings as shown on the Drawings. Multi-pole circuit breakers shall have a common operating handle.
2. Provide circuit breakers with interrupting capacity as indicated on plans, minimum interrupting capacity shall be 14,000 symmetrical rms Ampere at 480/277 Volts and 10,000 Ampere at 208/120 Volts.
3. Fusible switches shall be of the quick-made, quick-break, visible blade type and shall be UL listed and horsepower rated. Phase sequence and circuit numbering shall be uniform. Temperature rise and current carrying capacity of busses and parts shall be in accordance with NEMA Standards and NEC requirements. Provide fuses as specified under paragraph, "Fuses", in Section 260553.

4. When indicated, provide circuit breakers and switches with shunt-trips, motor operators or other features as required for the application.
 5. All circuit breakers shall be pad-lockable in the "OFF" position. All switches shall be pad-lockable in either the "OPEN" or "CLOSE" position.
- D. Identification:
1. Nameplates: Provide nameplates and warning signs as specified, in Section 260553.
 2. Provide a nameplate for each circuit breaker or fusible switch with wording to indicate load served.
 3. The main nameplate shall give the switchboard designation in 1/2" (1.3 cm) high letters. A second line in 1/4" (0.6 cm) high letters shall indicate the Ampere, Voltage –Phase and Wire. The third line of same dimensions as the second line shall indicate where the equipment fed from.
- E. Finish: Supporting framework, cover plates and other metal surface shall first be given a phosphate coating for superior paint adhesion and corrosion resistance. Alkyd amine standard gray enamel shall be electrostatically applied and baked thoroughly in a convection-type oven to ensure a long lasting, mark resistant finish.
- F. Acceptable Manufacturers: Switchboard assembly, switches, circuit breakers, devices and major components shall be of the same manufacturer. Acceptable manufacturers are Square D, General Electric, or Cutler Hammer.

2.8 DISTRIBUTION PANELBOARDS

- A. General: Distribution panelboards in general shall comply with the requirements of the distribution switchboards except that distribution panelboards shall be suitable for wall mounting instead of free floor standing.

END OF SECTION

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SECTION 262726 – WIRING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.
- B. This Section is a Division 26 Basic Electrical Materials and Methods section, and is part of each Division 26 section making reference to wiring devices specified herein.
- C. Related Sections:
 - 1. Division 01 Section “General Commissioning Requirements”, for commissioning procedures.

1.2 DESCRIPTION OF WORK

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of Decora Style electrical wiring devices in this Section include the following:
 - 1. Receptacles.
 - 2. Ground-fault circuit interrupters.
 - 3. Switches.
 - 4. Wallplates.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical wiring devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than three (3) years.
- B. Installer’s Qualifications: Firm with at least two (2) years of successful installation experience on projects utilizing wiring devices similar to those required for this project.
- C. CEC Compliance: Comply with CEC as applicable to installation and wiring of electrical wiring devices.
- D. UL Compliance: Provide wiring devices which are UL-listed and labeled.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on electrical wiring devices.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers providing wiring devices which may be incorporated in the work include, but are not limited to, the following (for each type and rating of wiring device):
1. Leviton Manufacturing Co. Inc.
 2. Arrow-Hart, Cooper Industries
 3. Pass & Seymour (Legrand)
 4. Harvey Hubbell Inc.
 5. Intermatic (timer switches).

2.2 FABRICATED WIRING DEVICES

- A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds. Pub/No. WD 1. Provide switched receptacle, controlled by occupancy sensor, as indicated per-plan – switched receptacle shall have factory identified marking. Provide white color devices except as otherwise indicated.
- B. Receptacles:
1. All receptacles shall be the grounding type with ground connection made through an extra pole which shall be permanently connected to the green grounding conductor.
 2. Duplex receptacles for 20 ampere, 120 volt service shall be two-pole, three-wire receptacles rated 20 amperes at 125 volts.
 3. Single receptacles for 20 amps, 120 volts service shall be two-pole, three-wire rated 20 amperes at 125 volts.
 4. Ground-fault Circuit Interrupters as required per-Code.
 5. Style: Receptacles shall be Decora style nylon.
 6. Color: White.
- C. Switches:
1. Snap: Provide decorator switches, rated 20 amperes at 120/277 volts quiet type and shall be UL approved without derating for tungsten lamp loads or inductive loads.
 2. Rotary spring wound timer switches: 0-60 minutes 20A. Inductive load rated.
 3. Color: White unless otherwise noted.

2.3 WIRING DEVICE ACCESSORIES

- A. Wall plates: Provide wall plates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as indicated. Select plates which mate wiring devices to which attached. Construct with metal screws for securing plates to devices.
 - 1. Screw heads colored to match finish of plates.
 - 2. Finish: Brushed Stainless Steel.
- B. Manufacturers: Subject to compliance with requirements, manufacturers providing wallplates may be incorporated in the work include, but are not limited to, the following (for each type and rating of wiring device):
 - 1. Leviton Manufacturing Co. Inc.
 - 2. Pass & Seymour (Legrand)
 - 2. Lutron Electronics, Inc.
 - 3. Harvey Hubbell Inc.

PART 3 – EXECUTION

3.1 INSTALLATION OF WIRING DEVICES

- A. Install wiring devices as indicated, in accordance with manufacturer's written instructions, applicable requirements of CEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Where receptacles are shown to be mounted of above counter, refer to Architectural Drawings for cabinet locations and mount receptacle box to clear backsplash of all counters by a minimum of two inches.
- C. Install device plates in full contact with wall surface or surface mounted box.
- D. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.
- E. Install wiring devices after wiring work is completed.
- F. Install wall plates after painting work is completed.

3.2 PROTECTION OF WALLPLATES AND RECEPTACLES:

- A. Upon installation of wall plates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of substantial completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

3.3 GROUNDING:

- A. Provide equipment grounding connections for all wiring devices, unless otherwise indicated. Wiring device grounding shall be bonded to equipment ground wire of the branch circuit serving device in its outlet box.

3.4 TESTING:

- A. Prior to energizing circuitry, test wiring for electrical continuity, and for short- circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements.

END OF SECTION