

University of California, Davis
Medical Center
East Wing 3rd Floor Bed Re-Licensure
M054016 / 9557320

Project Manual

Construction Documents

DSI0004

HGA

Hammel, Green and Abrahamson, Inc.
1200 R Street, Suite 100
Sacramento, California 95811
(916) 787-5100

HGA Commission Number
1500-146-00

OSHPD No. S202226-34-00

Facility ID #10619

27 AUG 2021

DOCUMENT 00 01 05
CERTIFICATIONS PAGE

ARCHITECTURAL



STRUCTURAL



MECHANICAL



ELECTRICAL



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**SECTION 01110
SUMMARY OF THE WORK**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Description of the Work
- B. Contractor Warrants
- C. Contract Document Intent and Relationships
- D. University Furnished / Contractor Installed Products
- E. Concurrent Work Under Separate Contracts
- F. Site Condition Survey and Protection of Existing Improvements
- G. Contractor Use of Site and Premises
- H. University Beneficial Occupancy (if applicable)
- I. Project Phasing (if applicable)

1.02 DESCRIPTION OF THE WORK

- A. Project is titled: E7 REACTICATION PROJECT
- B. UCDCMC Project No.: 9559460
- C. Project is located at 2315 Stockton Blvd, University of California, Davis Medical Center, Sacramento, California, as shown on the vicinity map.
- D. Scope: Phase 2-5 of the Project consists of remodeling and upgrading multiple rooms and areas East Wing 3RD Floor Patient Care Suite. Refer to A000 for Work Packages and A043 for Overall Work Plan. Refer to Contract Documents for complete scope of work.
- E. Existing building was constructed in 1967, with interior partitions constructed of lath and plaster studs. Contractor shall provide temporary supports for existing interior partitions.
- F. Work at the 3rd floor will be performed in sequence per each Phase. In General, the work of the next Phase will not commence until work of the prior phase has been completed and accepted by OSHPD Field Officers. **Refer to Bid Reference Document "Preliminary Phasing Plan".**
- G. The East Wing 3RD Floor Patient Care Suite will be occupied 24/7 by patients and Patient Care Staff.
- H. Work at the 2nd floor shall be pre-coordinated minimum 30 days in advance with University's Representative & Patient Care Services. Work performed at a single 2nd floor room will be completed before working in the next 2nd floor room.

- I. East Wing 2nd and 4th patient care floors are occupied 24/7 by patients and Patient Care Staff. All activities that generate noise shall be coordinated with The University Representative and Patient Care Services staff minimum of 72 hours in advance. When requested, contractor will perform "sample noise tests" to be witnessed by University Representative and Patient Care Services staff.

J. Contractor shall use Marquee Fire Protection (copy/paste from E7 Phase1)

K. Contractor shall use WestCom for all upgrades to Nurse Call System (copy/paste from E7 Phase1)

L. Above-ceiling containments (full abate within and so IORs cannot see adjacent existing work).

1.03 CONTRACTOR WARRANTIES

- A. Contractor warrants that it is skilled and experienced in the use and interpretation of Contract Documents such as those included in the bid documents for this Contract. The Contractor further warrants that it has carefully reviewed the Contract Documents for this Work and has found them to be free of ambiguities and sufficient for bid purposes.
- B. Contractor warrants that it has inspected the Project Site and based on these observations, has satisfied itself as to the nature and location of the Work; and any special conditions likely to be encountered at the site which may affect the performance of the Work.
- C. Contractor warrants that its bid is based solely on the Contract Documents provided, its own observations, and written explanations and interpretations obtained from University's Representative and not on any explanation or interpretation, oral or written, from any other source.

1.04 CONTRACT DOCUMENT INTENT AND RELATIONSHIPS

- A. Contract Documents Intent: Provide all labor, material, equipment, tools, transportation, insurance, services and all other requirements necessary to construct the project described in the Contract Documents.
- B. Relationship of Contract Documents: Drawings, Specifications and other Contract Documents in the Contract are intended to be complementary. What is required by one shall be as if required by all. What is shown or required, or may be reasonably inferred to be required, or which is usually and customarily provided for similar work, shall be included in the Work. For example, the drawings may not show every variation of an anchor clip that is required to support a curtain wall from its structural support; it can be reasonably inferred that variations of or additions to these clips are necessary to complete the installation of the working system and therefore all such clips are understood to be included in the Work.
- C. Discrepancies in Contract Documents: In the event of error, omission, ambiguity or conflict in the Contract Documents, Contractor shall bring the matter to University's Representative's attention in a timely manner, for University's Consultant's determination and direction in accordance with provisions of the General Conditions of the Contract.
- D. Bidding and Contract requirements: Information for bidding, Conditions of the Contract and other Contract documents will be produced by University and may be included in the Contract Documents for convenience. Such documents are not Specifications.

Specifications are found in Divisions 1 through 16 of the Contract, as listed in the Table of Contents of the Contract.

- E. Contract Drawings: The Drawings provided with and identified in the Contract are the Drawings referenced in the Agreement.
1. Drawings produced for this project may encompass Civil, Landscape, Architectural, Structural, HVAC, Plumbing, Piping, Fire Protection, and Electrical portions of the Work. Interior Design drawings may also be provided for product selection and installation information.
 2. The location, extent and configuration of the required construction and improvements are shown and noted on the Drawings. A list of Drawings is included in the Contract Documents.
 3. Drawings are arranged according to design discipline. Such organization and all references to trades, subcontractor, specialty contractor or supplier shall not control the Contractor in dividing the work among subcontractors or in establishing the extent of the work to be performed by any trade.
 4. Where the terms "as shown", "as indicated", "as noted", "as detailed", "as scheduled" or terms of like meaning, are used in the Drawings or Specifications, it shall be understood that reference is being made to the List of Drawings and the Specifications as bound in the Contract Documents.
 5. Where reference to the word "plans" is made anywhere in the Drawings, Specifications and related Contract Documents, it shall be understood to mean the Drawings listed in the List of Drawings.
- F. Contract Specifications: The Specifications provided as a part of the Contract Documents are the Specifications referenced in the Agreement.
1. The Specifications are organized by Division and Sections in accordance with recommended practice of the Construction Specifications Institute. Such organization shall not control the Contractor in dividing the work among subcontractors or in establishing the extent of the work to be performed by any trade.
 2. Specifications are included in the Contract, which also includes other Bidding and Contract Documents. Contents of the Contract are listed in the TABLE OF CONTENTS.
 3. Information for bidding, Conditions of the Contract and other Contract documents will be produced by University. Such documents are not Specifications. Specifications are found in Division 1 through 16 of the Contract.

1.05 UNIVERSITY-FURNISHED, CONTRACTOR-INSTALLED PRODUCTS

A. University-Furnished Products: University will furnish, for installation by Contractor, products which may be identified on the Drawing and in the Specifications as UFCI (University-Furnished / Contractor-Installed).

1. Refer to Plans and Specs.

- B. Relationship to Work Under the Contract: Work under the Contract shall include all provisions necessary to fully incorporate such products into the Work, including, as necessary, fasteners, backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, and field finishing, as shown on the Drawings and/or Specified herein. See Section 01310 - COORDINATION for additional requirements.

1.06 CONCURRENT WORK UNDER SEPARATE CONTRACTS

- A. Work Under Separate Contracts: University will award separate contracts for the following work and other work as may be indicated on Drawings as NIC (Not in Contract), including the following:

1. Test and balance work.
2. Inc3 Project I140010-34-03 / 9559040
3. Elevator Upgrades Project S162287-34-00 / 9559020
4. Phase-1 E7 EEG Office Relocation S180582-34-00/ 9559460
5. E7 Reactivation Project S173071-34-00 / 9559240

- B. Relationship to Work Under the Contract: Work under the Contract shall include all provisions necessary to make such concurrent work under separate contracts complete in every respect and fully functional, including field finishing. Provide necessary backing, supports, piping, conduit, conductors, and other such provisions from point of service to point of connection for additional requirements.
- C. Related Contract Documents: University will make available, in a timely manner, Contract Documents of work under separate contracts for coordination and further description of that work. Such drawings and other data required for the coordination of the work of separate contracts with the Work of this Contract may be included with the Contract Documents. If so, they are provided for convenience only and are not to be considered Contract Documents.

1.07 SITE CONDITION SURVEY & PROTECTION OF EXISTING IMPROVEMENTS

- A. Site Condition Survey: Prior to commencing work, the Contractor, University's Representative and other University representatives shall tour the Project site together to examine and record the existing condition of site, adjacent buildings, and improvements. This record shall serve as a basis for determination of damage (if any) due to the construction process. The record shall be signed by all parties participating in the tour.
- B. Protection of Existing Improvements: Locate all known existing utilities prior to proceeding with construction. Existing utilities shall be kept in service where possible and protected by the Contractor from damage. If any structure or utility is damaged, take immediate action to ensure the safety of persons and University property and effect repair. If previously undiscovered structures or utilities are encountered, request University's Representative to provide direction on how to proceed with the work. Cracks, sags or damage to adjacent structures or improvements not noted in the original survey shall be reported to University's Representative.
- C. Contractor shall provide temporary supports as required to protect existing building elements.

- D. University does not normally charge for its shutdown support services. However, if poor planning or execution of a shutdown by Contractor causes excessive time and effort for University, University reserves right to backcharge Contractor for additional work.

1.08 CONTRACTOR USE OF SITE AND PREMISES

- A. Site Access: Limit access to site as indicated on the drawings. If routes and access points are not indicated, access shall be as directed or approved by University's Representative.
- B. Hours of Operation: Construction activities are limited to the hours of 7:00 AM to 5:00 PM, Monday through Friday. Prior University approval is required for Contractor construction work at any other time or day.
- C. Construction Limit: Limit construction activities to areas indicated on Drawings as Project Area or, if not indicated, to areas immediately adjacent to buildings and as necessary for immediate construction or utility services and sitework, See Section 01510 - TEMPORARY UTILITIES for additional requirements.
- D. Utility Outages and Shutdowns: Schedule utility outages and shutdowns to times and dates acceptable to University's Representative. Duration of outages and shutdowns shall not hinder University normal business operations. Provide fourteen (14) days notice of all utility outages and shutdowns.

1.09 UNIVERSITY "BENEFICIAL OCCUPANCY"

- A. The following portions of the Work are designated for "occupancy" by University as indicated: All areas will be "occupied" by University's IT Department staff, Clinical Engineering staff, PCS Management staff, Pharmacy staff, Aux Services Department staff, EVS Department staff, Dietary staff and PO&M staff directly after the punch list has been published. Contractor shall perform punch list scopes of work concurrent with this "occupancy". Occupancy per CAC shall follow completion of the contract scope, final OSHPD inspections and receipt of OSHPD Certificate of Substantial Compliance.

1.10 PROJECT PHASING - NOT USED

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not applicable to this Section

END OF SECTION 01110

SECTION 01250
CLARIFICATION/INFORMATION PROCEDURES

PART I - GENERAL

1.01 DESCRIPTION

- A. This Section contains the procedures to be followed by Contractor for submitting a Request for Information (RFI) upon discovery of any apparent conflicts, omissions, or errors in the Contract Documents or Drawings or upon having any question concerning interpretation.
- B. Section Includes
 - 1. RFI Administrative requirements
 - 2. RFI Procedures
 - 3. RFI Execution

1.02 RELATED DOCUMENT SECTIONS

- A. Conditions of the Contract: Governing requirements for changes in the Work, in Contract Sum and Contract Time.
- B. Section 01610 – PRODUCT REQUIREMENTS: Product options, substitutions, omissions and improper descriptions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Description: Section provides procedure for Contractors to obtain interpretation or clarification of the Contract Documents, or identify apparent conflicts, omissions, or errors in the Contract Documents.
- B. Responsible Person for Contractor: Submit name of the individual authorized to receive Requests for Information documents, and who is responsible for forwarding Request.
- C. RFI Format: Submit all Requests for Information on the form attached at the back of this Section.

1.04 RFI PROCEDURES

- A. RFI Format, Numbering and Subject:
 - 1. RFI Format: Submit all requests for clarification or additional information in writing to University's Representative using the RFI Request for Information form provided at the back of this Section or obtained from University's Representative.
 - 2. RFI Numbering: Number RFI's sequentially. Follow RFI number with sequential alphabetical suffix for resubmissions. For example, the first RFI is numbered "001". The second RFI is numbered "002" and so on. The first resubmittal of RFI "002" will be numbered "002a".

3. RFI Subject: Limit each RFI to one (1) subject only.
- B. RFI Submittal conditions:
1. Discovery of unforeseen condition or circumstance not described in the Contract Documents.
 2. Discovery of an apparent conflict, discrepancy or inconsistency in or between portions of the Contract Documents.
 3. Discovery of a situation, direction or apparent omission that cannot be reasonably inferred from the intent of the Contract Documents.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 EXECUTION OF RFI's

- A. Faxed RFI requests will be accepted. University's Representative's fax number is 916-734-7751. Notification time begins from date stamp of University's fax machine. Faxed RFI requests received after normal business hours and/or received on non-normal workdays, as defined in Specification Section 01310 – COORDINATION, Item 1.07.F.4.A will begin notification time starting at 7:00 AM the following business day.
- B. Failure to provide proper information: RFI's will not be recognized or accepted if, in the opinion of University's Representative, one of the following conditions exist:
1. Contractor submits the RFI as a request for substitution.
 2. Contractor submits the RFI as a Submittal.
 3. Contractor submits the RFI as a Contract Document discrepancy or omission without through review of the Documents (Capricious submission).
 4. Contractor submits the RFI assuming portions of the Contract Documents are excluded or by taking an isolated portion of the Contract Document in part rather than in whole.
 5. Contractor submits the RFI in an untimely manner without proper coordination and scheduling of Work of other Trades.
- C. Response Time: Request clarifications or information immediately upon discovery of need. Submit RFI's in a timely manner allowing full response time to avoid impacting Contract Schedule.
1. University's Representative, whose decision will be final, shall resolve issues and respond to questions of Contractor, in most cases, within fourteen (14) days. Actual time may be lengthened for complex issues, or shortened for expedited situations, as mutually agreed in writing.
 2. After submission of an RFI by Contractor and prior to receipt of the RFI response from University, the Contractor proceeds with effected Work at own risk. Any portion of the Work not constructed in accordance with University interpretation,

clarification, instruction or decision is subject to removal and replacement at Contractor expense.

- D. Failure to Agree: In the event of failure to agree to the scope of the Contract requirements, Contractor shall follow procedures set forth in Article 4 of the General Conditions of the Contract.

END OF SECTION 01250

Project No. 9557320
East Wing 3RD Floor Bed Re-licensure
OSHDP #S202226-34-00

REQUEST FOR INFORMATION

A/C #: 9559460 Project Title: E7 EEG OFFICE RELOCATION PROJECT

RFI #: _____ Date: _____ OSHDP #: S180582-34-00

University of California, Davis, Medical Center Facilities Design & Construction 4800 2 nd Avenue, Suite 3010, Sacramento, CA 95817 Attn.: Jim Davis P: 916-734-7024 F: 916-734-7751 Email: jamdavis@ucdavis.edu	From:	

SUBJECT: _____

SPEC SECTION/DRAWING #: _____ PARA: _____ DETAIL: _____
RM # _____ GRID # _____

TRANSMITTAL RECORD	Requestor to FD&C	FD&C to A/E	A/E to FD&C	FD&C to Requestor	Notes
Date Submitted					

INFORMATION NEEDED: _____

CONTRACTOR'S PROPOSED RESOLUTION: _____

REQUESTOR SIGNATURE: _____ REPLY REQUIRED BY: _____

ATTACHMENTS: _____

REPLY: _____

REPONDER SIGNATURE: _____ DATE: _____

UNLESS OTHERWISE INDICATED ABOVE, THE REPLY TO THIS RFI IS NOT INTENDED TO BE A CHANGE DIRECTIVE. SHOULD THE CONTRACTOR, SUBCONTRACTOR, OR
SUPPLIERS FEEL THAT THE REPLY WILL IMPACT THE PROJECT COST OR SCHEDULE; IT SHOULD IMMEDIATELY BE CONVEYED TO THE UCDMC FD&C PROJECT MANAGER
IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

COPIES: UCDMC CONSULTANTS _____ FILE

SECTION 01255
CONTRACT MODIFICATION PROCEDURES

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Change Order Administrative Requirements
- B. Documentation of Change in Contract Sum and Contract Time
- C. Change Procedures
- D. Field Orders
- E. Stipulated Sum Change Orders
- F. Unit Price Change Orders
- G. Time and Material Change Orders
- H. Execution of Change Orders
- I. Reconciliation of Change Orders

1.02 RELATED DOCUMENT SECTIONS

- A. General Conditions of the Contract: Governing requirements for changes in the Work, in Contract Sum and Contract Time.
- B. Section 01250 – CLARIFICATION/INFORMATION PROCEDURES
- C. Section 01290 – MEASUREMENT AND PAYMENT: Applications for Payment.
- D. Section 01610 – PRODUCT REQUIREMENTS: Product Options, substitutions, omissions and improper descriptions.
- E. Section 01770 – CLOSEOUT PROCEDURES: Project record documents.

1.03 CHANGE ORDER ADMINISTRATIVE REQUIREMENTS

- A. Responsible Person for Contractor: Submit name of the individual authorized to receive construction change documents, and who is responsible for informing others in Contractor's employ of subcontractors of changes in the work.
- B. Forms found in the Exhibits of the Contract:
 - 1. COST PROPOSAL Form
 - 2. SUPPORTING DOCUMENTATION FOR THE COST PROPOSAL SUMMARY Form
 - 3. CHANGE ORDER Form
 - 4. REPORT OF SUBCONTRACTOR INFORMATION Form

1.04 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

- A. Documentation of Changes in Contract Sum and Contract Time: Provide full information required for evaluation of proposal of proposed changes and to substantiate costs of changes in the Work.
 - 1. Maintain detailed records of Work completed on time and material basis.
 - 2. Document each quotation for a change in Contract Sum and Contract Time with sufficient data to allow evaluation of the quotation.
- B. Additional Data: Upon request, provide additional data to support computations.
 - 1. Quantities of products, labor and equipment.
 - 2. Taxes, insurance and bonds.
 - 3. Overhead and profit.
 - 4. Justification for change in Contract Time, if claimed.
 - 5. Credit for deletions from Contract, similarly documented.

1.05 CHANGE PROCEDURES

- A. University's Supplemental Instructions: Minor changes in the Work, not involving adjustments to the Contract Sum or Contract time, as authorized by the General Conditions of the Contract, may be presented using Supplemental Instructions or correspondence containing similar information.
- B. University Initiated Changes: A "Request for Proposal" may be issued by University's Representative, which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications.

1. The Request for Proposal may include an estimate of additions or deductions in the Contract Sum or Contract Time for executing the change and may include stipulations regarding overtime work and the period of time the requested response from the Contractor shall be considered valid.
 2. Contractor shall prepare and submit a response to the Request for Proposal within fourteen (14) days.
- C. Contractor initiated Changes: Contractor may propose a change by submitting a request for change to University's Representative, describing proposed change and its full effect on the Work.
1. Include statement describing reason for change, and full description of effects on Contract Sum, Contract Time, related Work and work being performed under separate contracts.
 2. Requests for substitutions shall be included under this category, with procedures as specified in Section 01610 – PRODUCT REQUIREMENTS.

1.06 FIELD ORDER

- A. Field Order: University's Representative may issue a "Field Order", signed by University's Representative, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. The document will describe changes in the Work, and will designate the method of determining what, if any, change is due in the Contract Sum or the Contract Time.
 2. Promptly execute the change in the Work.
- B. Cost and Time Resolution: Costs and time adjustments for changes in the Work shall be per provisions of the General Conditions of the Contract, unless otherwise agreed to prior to issuance.

1.07 CHANGE ORDERS

- A. Stipulated Sum Change Orders: Contractor's response to Request for Proposal or Field Order will be considered and a mutually acceptable adjustment in Contract Sum and Contract Time will be determined. Change Order for this stipulated amount will be prepared by University's Representative for execution by University and Contractor.
- B. Unit Price Change Order: Change Order will be prepared by University's Representative for execution by University and Contractor, based on mutually acceptable quantities and pre-determined unit prices.
1. For unit cost or quantities not pre-determined, the Work shall be accomplished under a Stipulated Sum Change Order, if there is no dispute over the estimated or stipulated maximum cost and time for the change.
 2. If the amounts are not defined or are disputed, a Field Order will be prepared and issued by University's Representative.

- C. Time and Material Change Orders: As directed for changes for where amounts are not defined or are disputed, Contractor shall execute the Work, keeping accurate records of time, both labor and calendar days, and cost of materials.
 - 1. Contractor shall prepare and submit an itemized account and supporting data after completion of the change, within the time limits indicated in the Conditions of the Contract.
 - 2. University's Representative will determine the change allowable in Contract Sum and Contract Time, as provided elsewhere in the Contract Documents, and make recommendation to University for acceptance of Change Order.
 - 3. Contractor shall provide full information as required and requested for evaluation of proposed changes, and to substantiate costs for changes in the Work.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 EXECUTION OF CHANGE ORDERS

- A. Execution of Change Orders: University's Representative shall prepare Change Order documents for signature by parties' as provided in the Conditions of the Contract.

3.02 RECONCILIATION OF CHANGE ORDERS

- A. Schedule of Values: Promptly revise the Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjustment to the Contract Sum.
- B. Schedules: Upon completion of the Change Order, promptly revise progress schedules to reflect changes in Contract Time, revising sub-schedules to adjust time for other items of Work as may be affected by the change. Submit revised schedules with next Application for Payment.

END OF SECTION 01255

**SECTION 01290
MEASUREMENT AND PAYMENT**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and presentation of Application for Payment.

1.02 RELATED DOCUMENTS AND SECTIONS

- A. GENERAL CONDITIONS of the Contract: Progress Payments and Final Payment.
- B. Section 01320 – CONTRACT SCHEDULES
- C. Section 01770 – CLOSEOUT PROCEDURES

1.03 PAYMENT APPLICATION FORM

- A. Payment Application Form: Prepare Applications for Payment using Exhibit 4 provided in the Contract or, if otherwise directed, prepare Applications for Payment on AIA Document G702 – Application and Certification for Payment; include continuation sheets as necessary, using AIA Document G703 – Continuation Sheet.

1.04 PREPARATION OF APPLICATIONS

- A. Preparation of Applications for Payment: The following requirements supplement the provisions of the General Conditions of the Contract. Refer to the GENERAL CONDITIONS OF THE CONTRACT.
 - 1. Present required information typewritten on the required forms. Media-driven forms are acceptable.
 - 2. Execute certification by wet ink signature of authorized officer of the Contractor.
 - 3. Use data from the approved Schedule of Values. Provide dollar value in each column of application for each line item and portion of Work performed and for products stored, if permitted.
 - a. List value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for progress Payments. Round off values to nearest dollar. Listed items of work shall be identified by Specification Section number.
 - b. List products and operations of each major subcontract as separate line item.
 - c. Include Work Allowances (if any) within line item of Work.
 - d. Coordinate listings with Progress Schedule.
 - e. Component listings shall each include a directly proportional amount of Contractor's overhead and profit.

- f. For items on which payments will be requested for stored products. List sub-values for cost of stored products with taxes paid.
 - g. Submit a sub-schedule for each separate Phase of Work specified in Section 01110 – SUMMARY OF THE WORK. Include scheduling of sequences for Phase of the Work as indicated in the Contract Documents.
 - h. The sum of values listed shall equal total Contract Sum.
- 4. List each authorized Change Order as an extension on the continuation sheet, listing the Change Order number and dollar value as for an original item of Work. Change Order shall be broken down same as Application for Payment.
- 5. No Change Order shall be included with Application for Payment until approved in writing by University and University's Representative.
- B. Final Payment: Prepare Application for Final Payment as specified in Section 01770 – CLOSEOUT PROCEDURES.

1.05 SUBMISSION OF APPLICATIONS FOR PAYMENT

- A. Submission of Applications for Payment: The following requirements supplement provisions of the General Conditions of the Contract. Refer to the GENERAL CONDITIONS OF THE CONTRACT.
 - 1. Submit one (1) copy of each Application for Payment with one (1) original wet ink signature. Round values to nearest dollar or as specified for the Schedule of Values.
 - 2. Submit an updated Construction Progress Schedule with each Application for Payment and specified in Section 01320 – CONTRACT SCHEDULES.
 - 3. Submit one (1) copy of the Schedule of Values in accordance with the General Conditions of the Contract. Form and content shall be acceptable to University. Transmit under transmittal letter. Identify Project by A/C # and name.
 - a. List installed value of each major item of Work and for each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar. Listed items of Work shall be identified by Specification section number.
 - b. For each major subcontract, list products and operations of that subcontract as separate line items.
 - c. Coordinate listings with Progress schedule.
 - d. Component listings shall each include a directly proportional amount of Contractor's overhead and profit.
 - e. For items on which payments will be requested for stored products, list sub-values for cost of stored products with taxes paid.

- f. Submit a sub-schedule for each separate Phase of Work specified in Section 01110. Include scheduling of sequences within each phase indicated on the drawings.
 - g. The Sum of values listed shall equal total Contract Sum.
 - h. When University's Representative requires substantiating information, submit data justifying line item amounts in question.
 - i. Provide one (1) copy of data with cover letter for each copy of Application. Show Application number and date, and line item by number and description.
4. Submit Applications for Payment, Continuation Sheets and Schedule of Values under transmittal letter. Contractor shall identify all payment application documents by University's Project Name and University's Project Number.

1.06 SUBSTANTIATING DATA

- A. University's Representative may request substantiating information. Submit data reconciling line item amounts in question.
- B. Provide one (1) copy of data with cover letter for each copy of submittal. Show Application number and date and line item by number and description.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01290

**SECTION 01310
COORDINATION**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Project Meetings
- B. Submittals Requirements
- C. General Contractor Coordination
- D. Coordination of Subcontractor and Separate Contracts
- E. University Criteria

1.02 RELATED REQUIREMENTS

- A. Section 01110 – SUMMARY OF THE WORK: Description of Contract Documents.
- B. Section 01320 – CONTRACT SCHEDULES
- C. Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- D. Section 01350 – SPECIAL PROCEDURES: Interim Life Safety Measures (ILSM).
- E. Section 01450 – QUALITY CONTROL
- F. Section 01455 – INSPECTION OF WORK
- G. Section 01510 – TEMPORARY UTILITIES
- H. Section 01520 – CONSTRUCTION FACILITIES
- I. Section 01550 – VEHICULAR ACCESS AND PARKING: Traffic Regulation.
- J. Section 01560 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS
- K. Section 01561 – AIRBORNE CONTAMINANTS CONTROL
- L. Section 01610 – PRODUCT REQUIREMENTS
- M. Section 01730 – CUTTING AND PATCHING
- N. Section 01770 – CLOSEOUT PROCEDURES: Coordination of completion reviews, inspections and submission of documents.
- O. Section 01780 – CLOSEOUT SUBMITTALS: Record Drawings.

1.03 MEETINGS

- A. Pre-Construction/Site Mobilization Conference: University's Representative will administer site mobilization conference at Project site for clarification of responsibilities of University, University's Representation and Contractor, use of site and for review of administrative procedures. Site mobilization conference shall be held within fourteen (14) days of Notice to Proceed, unless otherwise directed by University's Representative.
1. Agenda: Pre-Construction/Site Mobilization Conference shall cover the following topics at a minimum:
- a. Special Project Procedures: Implementation of requirements as specified in Section 01310 – COORDINATION.
 - b. Subcontractors List: Distribute and discuss list of subcontractors and suppliers.
 - c. Construction Schedule: Distribute and discuss initial construction schedule and critical work sequencing of major elements of Work, including coordination of University furnished/Contractor installed (UFCI) products and work under separate contracts, by utility agencies and companies and University.
 - d. Designation of Key personnel: Designate key personnel and update project directory for University, University's Consultants, Contractor, major subcontractors, major materials suppliers, serving utility agencies and companies, other contractors performing work under separate contracts and governing authorities having jurisdiction.
 - e. Project Communication Procedures: Review requirements and administrative requirements for written and oral communications.
 - f. Change Procedures: Review requirements and administrative procedures for Change Orders, Field Orders, University's Representative's Supplemental Instructions, and Contractor's Requests for Information.
 - g. Coordination: Review requirements for Contractor's coordination of Work; review sequence and schedule for work being performed for University under separate contracts.
 - h. Submittals Administration: Review administrative procedures for shop drawings, project data and sample submittals and review of preliminary submittals schedule.
 - i. Project Record Drawings: Review requirements and procedures for project record drawings and specifications.
 - j. Construction Facilities and Temporary Utilities: Designate storage and staging areas, construction office areas; review temporary utility provisions; review University requirements for use of premises.
 - k. Materials and Equipment: Review substitution requirements; review schedule for major equipment purchases and deliveries; review materials and equipment to be provided by University (UFCI products).

- I. Site Access by University's Representative and University's Consultants: Review requirements and administrative procedures Contractor may institute for identification and reporting purposes.
 - m. Testing and Inspection: Review tests and inspections by independent testing and inspection agencies, manufacturers, and governing authorities having jurisdiction.
 - n. Permits and Fees: Review Contract requirements; review schedule and process for obtaining permits and paying fees.
- B. Billing Meetings: A billing meeting will be conducted by the University's Representative each month prior to submittal of the Application for Payment. Agenda: review of the percent complete relating to the submitted Schedule of Values.
- C. Progress Meetings: Progress meetings shall be periodically scheduled throughout progress of the Work. Frequency shall be as determined necessary for progress of Work. Generally, it is intended progress meetings be held once a week as designated by the University's Representative.
 - 1. Administration: University's Representative shall make physical arrangements for meetings and prepare agenda with copies for participants, preside at meetings, record minutes and distribute copies within four (4) days to Contractor University's Consultants, and other participants affected by decisions made at meetings.
 - 2. Attendance: Contractor's Project Manager and jobsite Superintendent shall attend each meeting. Contractor's subcontractors and suppliers may attend as appropriate to subject under discussion. University will have a representative at each meeting. University's Consultants, as appropriate to agenda topics for each meeting and as provided in University/Consultant Agreement, will also attend.
 - a. Suggested Agenda for Progress Meetings:
 - 1) Building Code/Fire Marshal Issues
 - 2) Design Issues
 - 3) Submittals and Long Lead Items
 - 4) Request for Information
 - 5) Safety Issues
 - 6) Scheduling Status/2 Week Look Ahead
 - 7) Inspection Requests
 - 8) Utility Shutdowns and Dig Notifications
 - 9) Instructional Bulletins and Field Orders
 - 10) Change Orders/Cost Proposals

- 11) Payment Applications and As-Built Drawings
 - 12) Miscellaneous Business
 - 13) Other items affecting progress of the Work
- D. Guarantees, Bonds, Service and Maintenance Contracts Review Meeting: Eleven months following the date of Substantial Completion, a meeting will be conducted by University's Representative to review the guarantees, bonds and service and maintenance contracts for materials and equipment.
- E. In addition to meetings listed above, Contractor shall hold coordination meetings and pre-installation conferences to assure proper coordination of Work.
1. Pre-installation Conferences: When required in individual Specification Sections, convene a pre-installation conference prior to commencing Work.
 - a. Require attendance by representatives of firms whose activities directly affect or are affected by the Work specified.
 - b. Review conditions of installation, preparation and installation procedures and coordination with related Work and Work under separate contracts.
- F. Location of all meetings will be as designated by University's Representative. Participants at all meetings shall be University's Representatives, Consultants and/or Vendors, Contractor, Superintendent, Subcontractors and others as appropriate.

1.04 SUBMITTALS

- A. Coordination of Submittals: Schedule and coordinate submittals as specified in Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES, Section 01770 – CLOSEOUT PROCEDURES and Section 01780 – CLOSEOUT SUBMITTALS.
1. Coordinate submittal effort of various trades, subcontractors and suppliers having interdependent responsibilities for installing, connecting, and placing into service such equipment, materials or installations as necessary for the Work.
 2. Coordinate requests for substitutions to assure compatibility of space, operating elements, and effect on work of others.
 3. Contractor shall submit the following submittals to the University's Representative who will forward directly to the appropriate State Agencies for their review and approval:
 - a. Refer to Bid Reference Documents.
- B. Coordination/Engineering Drawings: Submit in accordance with Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES and as specified herein.
- C. Work Plans: Submit as specified herein.

1.05 COORDINATION

- A. Coordination: Contractor shall coordinate the Work as stated in the General Conditions of the Contract. Work of the Contract includes coordination of the entire work of the Project, from beginning of construction activity through Project closeout and warranty periods. Contractor shall also coordinate Work under the Contract with work under separate contracts by University. Contractor shall cooperate with University and others as directed by University's Representative in scheduling and sequencing the incorporation into the Work of University Furnished/Contractor Installed (UFCI) products identified in the Contract Documents.
1. Coordinate completion and cleanup of work of the separate trades, subcontractors, vendors, etc., in preparation for University occupancy
 2. After University occupancy, coordinate access to site by various trades, subcontractors, vendors, etc., for correction of defective work and/or work not in accordance with Contract Documents, to minimize University disruption.
 3. Assemble and coordinate closeout submittals specified in Section 01770 – CLOSEOUT PROCEDURES.
- B. Construction Interfacing and Coordination: Layout, scheduling and sequencing of Work shall be solely Contractor's responsibility. Contractor shall bring together the various parts, components, systems and assemblies as required for the correct interfacing and integration of all elements of Work. Contractor shall coordinate Work to correctly and accurately connect abutting, adjoining, overlapping and related elements, including work under separate contracts by University and utility agencies, if any.
- C. Installation of Systems into Project Space: Follow routings shown for pipes, ducts and conduits as closely as practicable, as shown on the Contract Documents with due allowance for available physical space; make runs parallel with line of building. Utilize space efficiently to maximize accessibility for other installations, future maintenance and repairs. In finished areas, except as otherwise shown, conceal pipes, ducts and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- D. Utility Work: Work occurring on or in the immediate vicinity of critical utilities must be directly supervised at all times by Contractor's qualified personnel. Requirements stated herein for notification, work plans, dig notification forms and marking locations of existing utilities shall apply. Contractor will be held fully liable for costs and damages due to unplanned interruption of critical utilities, including any personal injury to Hospital patients, visitors or staff.
1. Provide supervision and coordination necessary to meet requirements of electrical power connection as set forth by the Sacramento Municipal Utility District (SMUD).
 2. Provide reasonable and convenient staging and access areas to permit SMUD, its vendors or subcontractors, to install, modify or remove electrical transformers or other components of the electrical power system furnished and installed by SMUD.

1.06 COORDINATION OF SUBCONTRACTORS AND SEPARATE CONTRACTS

- A. Conflicts: Conflicts shall be resolved by the Contractor. Contractor bears primary responsibility for conflict resolution regarding the coordination of all building trades, subcontractors and suppliers.
- B. Superintendence of Work: Contractor shall appoint a field superintendent who shall direct, supervise, and coordinate all Work in the Contract Documents.
- C. Subcontractors, Trades and Materials Suppliers: Contractor shall require all subcontractors, trades, crafts and suppliers to coordinate their portions of Work with the Superintendent to prevent scheduling, sequencing, dimensional and other conflicts and omissions.
- D. Coordination with Work Under Separate Contracts: Contractor shall coordinate and schedule Work under Contract with work being performed for Project under separate contracts by University. Contractor shall make direct contacts with parties responsible for work of the Project under separate contracts, in order to provide timely notifications and to facilitate information exchanges.
- E. Service Connections: Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work; final connection of electrical services to general work is defined as electrical work.

1.07 UNIVERSITY CRITERIA

- A. During the Base Construction time, Contractor shall allow University to move University equipment and/or provide furnishings. Contractor shall notify University's Representative in writing a minimum of fourteen (14) calendar days prior to completion of area described above.
- B. Equipment Coordination: Contractor and University supplied equipment will require complete installation data be exchanged directly between Contractor and vendors and subcontractors involved as progress of Project requires. Individual requesting information shall advise when it is required. Incorrect, incomplete, delayed or improperly identified equipment causing delay or error in installation will require entity causing such action to be liable for modifications or replacements necessary to provide correct and proper installation, including relocations.
- C. Contractor shall provide large scale casework and equipment drawings for casework and equipment service rough-in locations (dimensioned from building features), service characteristics, and locations of studs or blocking where such locations are critical to mounting or otherwise installing equipment and casework. Furnish sizes and spacing required for mechanical and electrical cutouts, and a complete brochure of fittings, sinks, outlets, or other information to provide a complete assemblage of the items and accessories being furnished.

- D. **Interruption of Services:** Construction Work shall accommodate University's use of surrounding and adjacent premises during the construction period and shall provide continuous public access and use of surrounding and adjacent facilities. Contractor shall not deny access to public use facilities until an alternate means of public use has been provided. An interruption of service is defined as any event which in any way interrupts, disrupts or otherwise discontinues, even momentarily, the services provided by University to its patients and staff. Adequate notice, as described below, shall be given to University when any interruption of services or interference with the use of existing buildings and roads are anticipated. Any interruption of service will be made only by University upon such notice. Interruptions to University services will not be made without prior notification and approval by University. Contractor shall never interrupt any University service without direct University participation.
1. **Dig Notification:** Contractor shall complete and submit for review to University's Representative, a Dig Notification Form, included at the end of this section, and obtain written authorization from University prior to the commencement of any digging activities. Digging activities include exploratory demolition, soils excavation, concrete core drilling, and saw cutting. Contractor shall include all pertinent information with the Dig Notification Form and submit with detailed work plan fourteen (14) days prior to desired digging activity.
 2. Contractor shall mark locations of all known utilities on ground of dig area with marker paint.
 3. Prior to commencement of digging activities, Contractor shall verify project inspector has inspected the dig site and confirmed the site marking as accurate, complete and in conformance with site utility plans.
 4. Contractor shall verify with University's Representative that all interested hospital departments have been notified of intent to begin digging operation.
 5. Record documents are required for dig activities. Contractor shall provide as-built drawings.
- E. **Shutdown Procedures:** Contractor shall complete and submit for review and approval to University a Request for Shutdown form, included at the end of this section. Contractor shall include all pertinent information to assist University in coordination of shutdown activities. The Shutdown Request Form shall be submitted with a detailed work plan addressing the proposed shutdown not less than fourteen (14) calendar days prior to desired shutdown.
- F. The University does not normally charge for its shutdown support services. However, if poor planning and/or poor execution of a shutdown by the Contractor causes excessive time and effort for University personnel, the University reserves the right to backcharge the Contractor for this effort required to support such shutdown.
1. Contractor shall verify with University's Fire Marshal that all appropriate Interim Life Safety Measures (ILSM) are in place.
 2. Contractor shall determine that proper and appropriate coordination and notification has been completed, including written authorization from University's Representative, prior to shutdown.

3. Service shutdowns shall require specific work plans to be submitted to and coordinated with University's Representative. Work Plan should reflect various work trades, activities or entities requiring active participation with University teams to coordinating hospital functions with construction activities.
 - a. Contractor shall request, schedule, and conduct a General Work Plan Meeting prior to any work activity occurrence. During this meeting Contractor and University shall produce and agree to a list of work activities, which will require digging and/or shutdown coordination and procedures.
 - b. University's Representative, upon receiving the agreed submission for coordination, shall schedule the actual digging and/or shutdown at the earliest possible date not later than fourteen (14) days from receipt of the submission. Operation of valves, switches, etc. to affect shutdowns shall be operated by University personnel only.
 - c. A shutdown is defined as any interruption of services provided by University to its patients and staff.
 4. Planned service shutdowns shall be accomplished during periods of minimum usage. Contractor shall plan work to restore service in minimum possible time, and shall cooperate with University to reduce number of shutdowns.
 - a. Notwithstanding the provisions of Article 14.6 of the General Conditions of the Contract, Contractor may be required to perform certain types of work outside normal time periods.
 - 1) Non-normal times shall include, but not be limited to, periods of time before 7:00 AM and after 5:00 PM in the evening, weekend days, or legal holidays, or such periods of time which constitute split shifts or split working periods.
 - 2) Contractor shall include allocation of the cost of this work as part of the base bid and shall not be entitled to additional compensation as a result of such work during non-normal time periods.
 - 3) Contractor shall include the non-normal periods as distinct activities on the detailed project schedule.
 - 4) Contractor is advised and Contractor shall be prepared, at University written request, to perform certain shutdown and asbestos related work during non-normal time periods.
- G. Utility locations: General location of utility lines and services may be shown on the drawings or described elsewhere, University does not warrant the accuracy of the locations shown or described. Determination of the actual on-site locations of utility lines and services prior to the commencement of work shall be the responsibility of the Contractor. Contractor shall complete layout/research for Points of Connection (P.O.C.) and clean/prep piping at P.O.C. All capping, relocation or removal of such lines and services shall be performed by Contractor as a part of the Contract. New/continued piping and services installation shall be prefabricated and in place prior to the shutdown.

All materials and tools required to complete the work must be at the shutdown location(s). Contractor shall not assume existing valves will hold 100%. Contractor is required to have at least one (1) alternate method (including parts and equipment) to complete installation once shutdown has started. Note: only wheel type cutters shall be used on copper pipe to reduce contamination to existing systems/valves.

- H. Detailed Work Plans: Contractor shall develop and submit for review and approval to University's Representative detailed work plans for specific work activities, both inside and outside the work area, associated with impact to, or interruption of services and operation, and dig activities. Work Plans shall include written description of work activity, detailed schedule with proposed sequence of operation and activity duration, type of equipment to be used, a copy of site plan highlighted to indicate sequencing and location of work and equipment, completed Request for Shutdown and/or Dig Notification forms as applicable, conformance to ILSM, and control methods for noise, vibration and airborne contaminants.
1. Work Plan submittal will not be accepted unless all required information is provided at time of submittal.
 2. Submit Work Plan at least fourteen (14) calendar days prior to the commencement of any associated work activities.
 3. Coordination/Engineering Drawings: These drawings are for the Contractor's and University's use during construction and shall not be construed as replacing any shop drawings, "as-builts", or record drawings required elsewhere in the Contract Documents. University's review of these drawings is for design intent only and shall not relieve the Contractor of the responsibility for coordination of all work performed per the requirements of the Contract.
 - a. Contractor shall prepare and submit complete 1/4" = 1' - 0" coordination drawings, including plans, sections, details as are appropriate indicating the area layout, complete with debris removal area and materials access points, and all mechanical and electrical equipment in all areas and within ceiling spaces for new and existing conditions, including bottom of all duct, plenum, pipe and conduit elevations. Drawings shall show all structural and architectural restraints and other obstructions that may affect the work. Electronic or photo reproduction of University's Architectural Drawings is not acceptable.
 - b. Each Subcontractor shall ensure all relevant mechanical and electrical equipment, piping, conduit, ceiling hangers, etc., are shown and will fit, together with necessary items such as lights, ducts, fans, pumps, piping, conduit and the like.
 - c. Submit completed and fully coordinated drawings together with six (6) prints together with Contractor's comments indicating possible areas of conflict for review to University's Representative prior to start of work.
 - d. Penetrations: Contractor shall prepare a sleeving layout (1/4" scale) indicating size and locations of sleeves. Trades shall indicate to Contractor their requirements and locations. Provide copies to applicable trades and University's Representative.

- e. Completion of work: All coordination drawings shall be submitted together with record (as built) drawings of all trades involved in accordance with Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01310

REQUEST FOR SHUTDOWN (RFS) INFO/IMPACT REPORT

PROJECT NAME: E7 EEG Offices Relocation Project

UCDMC RFS #: _____

PROJECT #: 9559460 OSHPD #: S180582-34-00 CONTRACTOR RFS #: _____

TODAY'S DATE: _____ SHUTDOWN DATE: _____ SUSPEND DATE: _____

TO: UC DAVIS HEALTH Facilities Design & Construction 4800 2 nd Avenue, Suite 3010 Sacramento, CA 95817 P: 916-734-7024 F: 916-734-7751 Attention: <u>Jim Davis</u>	FROM: _____ _____ _____ _____ _____ _____

Request Date: _____ Shutdown Target Date: _____

Requested By: _____ Requestor's Phone #: _____

Shutdown Work (Utility Specific):

Scope (Brief Description of Work):

Impact (Areas & Users):

Additional Comments:

DIG NOTIFICATION FORM

PROJECT #: 9559460 OSHPD #: S180582-34-00 DATE: _____

TO: UC DAVIS HEALTH Facilities Design & Construction 4800 2nd Avenue, Suite 3010 Sacramento, CA 95817 P: 916-734-7024 F: 916-734-7751 Attention: <u>Jim Davis</u>	FROM: _____ _____ _____ _____ _____ _____

1. Has USA been notified?	YES	NO
When? _____		
2. Are all known utilities marked?	YES	NO
3. Location of dig shown on attached site plan?	YES	NO
Purpose _____		
4. Dates digging will take place _____		
Place _____		

Signed: _____

<u>UNIVERSITY USE ONLY</u>		
Date received: _____		
1. Utilities verified by IOR?	YES	NO
2. Dig activities coordinated with all parties?	YES	NO
3. Comments: _____		
Date Authorized: _____	Signed: _____	
Date Returned: _____	Signed: _____	
Comments: (Utilities encountered, disruptions, successes, weather, etc.)		
Copies: UCDMC	Consultants _____	File

**SECTION 01320
CONTRACT SCHEDULES**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Construction Progress Schedules
- B. Submittals Schedules
- C. Review of Schedules and Submittals
- D. Construction Progress Reports

1.02 RELATED DOCUMENTS AND SECTIONS

- A. GENERAL CONDITIONS OF THE CONTRACT: Requirements to provide schedules.
- B. Section 01110 – SUMMARY OF THE WORK: Subcontractor and materials suppliers list.
- C. Section 01255 – CONTRACT MODIFICATION PROCEDURES: Supporting data.
- D. Section 01290 – MEASUREMENT AND PAYMENT: Supporting data submittals.
- E. Section 01310 – COORDINATION: Progress Meetings.
- F. Section 1330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES: Shop drawings, product data and samples submittals.
- G. Section 01450 – QUALITY CONTROL: Test and Inspections Reports.
- H. Section 01770 – CLOSEOUT PROCEDURES: Occupancy/Acceptance/Final Payment Submittals.
- I. Section 01780 – CLOSEOUT SUBMITTALS: Preparation of maintenance and operating data.

1.03 CONSTRUCTION PROGRESS SCHEDULES

Contractor shall employ a professional scheduler to develop and update the contract schedule.

- A. Schedule Format: Prepare the Contract Schedules as P-6 Primavera, MS Project, or Phoenix software. Prepare the Contract Schedules as CPM, TIME-SCALED NETWORK DIAGRAMS SHOWING CONTINUOUS FLOW FROM LEFT TO RIGHT

Using opaque reproductions on substantial paper, with sheet size a multiple of 8-½" x 11" and large enough to clearly read characters. Prepare the schedule in sufficient detail to demonstrate adequate planning for the Work, and so that it represents a practical plan to complete the Work within the Contract time. Clearly indicate complete sequence of construction by major activity, including phasing with dates for beginning and completion of each element of Work.

1. Identify the following milestone events on the Contract Schedules:

a. Notice To Proceed	g. Warranty Completed
b. Submittals Completed	h.
c. Substantial Completion	i.
d. OSHPD Substantial Compliance	j.
e. Final Completion	k.
f. 11 Month Warranty Walk	l.

2. Identify all holidays and non-working days on the Schedules.

3. Construction activities:

Identify all applicable construction activities on the contract schedule including (but not limited to):

- a. Verification, Procurement, and Testing of Negative Air Units.
- b. Prepare, Submit, and Approve Submittals (Includes Deferred Approvals).
- c. Prepare, Submit/ Confirm, and Approve Haz Mat Work Plan (Asbestos).
- d. Prepare, Submit/ Confirm and Approve Haz Mat Work Plan (Lead).
- e. Prepare, Submit/ Confirm and Approve ILSM.
- f. Procurement of Materials.
- g. Contractor Perform Pre Readings Air Measures (for ICRA Purposes).
- h. Contractor Install Temp Construction Lighting.
- i. Safe-Off MEP in Order to Perform Work for Phase I.
- j. Install ICRA and ILSM Measures (Including Installation of Dividing Wall).
- k. Contractor Adjust Air Measurements (for ICRA Purposes).
- l. Equipment Removal (Including Equipment to Be Removed By UCDCMC).
- m. Temporary FA.
- n. Demolish Flooring.
- o. Demolish Ceiling.
- p. Demolish MEP
- q. Fire Proofing Removal and Application (Refer to the approved ICRA and ILSM for phasing).

- r. Fire Sprinklers rough-in and installation.
 - s. Fire Alarm rough-in and Installation
 - t. Nurse call rough-in and Installation
 - u. Framing.
 - v. Equipment backing and structural supports.
 - w. Seismic Bracing.
 - x. Door Frames.
 - y. Punch List.
 - z. Substantial Completion.
 - aa. Final Cleaning.
 - bb. Closeout Documentation.
 - cc. Final Completion.
-
- 4. Identify all holidays and non-working days on the Schedules.
 - 5. Identify days of off-hour work.
 - 6. Identify all Work activities that constitute the project critical path including:
 - a. Major Contractor-furnished equipment, materials, and building elements, and scheduled activities requiring submittals or University's prior acceptance. Show dates for submissions, reviews, and acceptance of each submittal. Dates shall be shown for the procurement, fabrication, delivery, and installation of major equipment, material, and building elements, and for scheduled activities designated by University Representative.
 - b. System test dates.
 - c. Scheduled overtime Work if required by Contract Documents.
 - d. Dates Contractor to request: designated working spaces, storage areas, access, and other facilities to be provided by University Representative; responses from University on designated issues; University-furnished equipment; University-furnished utilities.
 - e. Dates for connection and relocation of existing utilities; dates for connections to or penetrations of existing structures.
 - f. Scheduled inspections as required by Code, or as otherwise specified.

7. Critical path activities are defined as Work activities which, if delayed or extended, will delay or extend the scheduled completion of one (1) or more of the milestones specified in this Section or in the scheduled completion of the Work, or both. All other Work activities are defined as non-critical path Work activities and are considered to have associated float.
8. Float is defined as the time a non-critical Work activity can be delayed or extended without delaying the scheduled completion of milestones specified in this Section or the scheduled completion of Work, or both. Neither contractor nor University shall have exclusive right to the use of float. The entity using the float of any non-critical activity shall document the effect on the updated Contract Schedule.
9. Delays of non-critical Work activity shall not be the basis for an extension of Contract Time until the delays consume the float associated with the specific non-critical work activity and cause the Work to become critical.
10. Presentation of each Work activity on the Contract Schedule shall include a brief description of the Work activity, the duration of the Work activity in calendar days, and a responsibility code identifying the subcontractor, trade or vendor performing the Work activity.
11. Contractor shall furnish cost estimates for each Work activity that cumulatively equals the total contract cost. Mobilization costs may be shown separately; other costs, such as profit, and bond shall be pro-rated throughout all activities.

B. Updating:

1. Review Contract Schedule with University's Representative once each week to incorporate all changes in the progress, sequences, and scope of Works activities into the Contract Schedule. Contractor shall submit at each weekly progress meeting to University Representative, a two (2) week "look ahead" schedule in a bar chart format which incorporates all changes in progress, services, and scope of work activities.
2. Prepare and submit to University's Representative updated Contract Schedule once each month. Contractor shall submit the updated Contract Schedule, in the form acceptable to University, at least seven (7) days prior to submitting the Application for Payment.
3. Updated Contract Schedule shall accurately represent the as-built condition of completed and in-progress Work activities as of the date of the updated Contract Schedule.
4. Updated Contract Schedule shall incorporate all changes mutually agreed upon by Contractor and University during preceding periodic reviews and all changes from Change Orders and Field Orders. University will determine acceptability of updated Contract Schedule within seven (7) days of its receipt.
5. The Accepted, updated Contract Schedule shall be the Contract Schedule of record for the period it is current and shall be the basis of payment during that period.

1.04 SUBMISSIONS

- A. Preliminary Contract Schedule: Submit a preliminary schedule to University's Representative either:
1. Within ten (10) days of receipt of the Notice of Selection as apparent lowest responsible bidder or, with the Agreement under separate transmittal letter.
 2. Adjustments to Preliminary Contract Schedule: Within seven (7) days of receipt of the Preliminary Contract Schedule, University's representative will notify Contractor in writing of acceptance of Schedule, or submit to Contractor request for adjustments to Contract Schedule.
- B. Contract Schedule: Submit the finalized Contract Schedule, in the form and having general content acceptable to University's Representative within fifteen (15) days following Notice to Proceed and prior to submitting the first Application for Payment. Submit monthly revised Contract Schedules thereafter, accompanying the Applications for Payment. Within seven (7) days of receipt of the Contract Schedule, University's Representative will notify Contractor in writing of acceptance of the revised Contract Schedule.
1. Payment Processing Restriction: No Application for Payment will be processed nor any progress payment become due until Contract Schedule is accepted by University.
 2. Posting: Post one (1) copy minimum, of most recent Contract Schedule in the construction job site office, readily available to University and University's Representative.
 3. Archive: Preserve a minimum of two (2) copies of all superceded schedules, with a minimum of one (1) copy available at job site office for review by University or University's Representative.
- C. Submittals Schedule: Prepare Submittals Schedule in a format at Contractor's option, either bar chart, PERT, or GANTT format, using opaque reproductions on substantial paper, with sheet size a multiple of 8-½" x 11" and large enough to clearly read characters. Coordinate format with Contract Schedule, specified above.
1. Submittals Schedule Content: List all items specified to be submitted, indicating submittal number, submittal type (product data, shop drawings, samples, quality control report, maintenance and operating data, and other descriptions); scheduled data submittal shall be made and date review be complete in order to maintain construction schedule.
 2. Administration: Submit initial Submittals Schedule within fourteen (14) days of date of Agreement. After review, resubmit Submittals Schedule within ten (10) days and thereafter submit updated Submittals Schedules at each Construction Progress Meeting. Submit one (1) copy each to University and University's Consultant. Posting/Archiving shall be same as Contract Schedule.

1.05 REVIEW OF SCHEDULES AND SUBMITTALS

- A. University Representative and University's Consultant's Review of Schedules: Schedule review by University's Representative and University's Consultants shall be only for general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents.
 - 1. Review by University's Representative and University's Consultants shall not relieve the Contractor of compliance with requirements of the Contract Documents.
 - 2. Changes in the Work shall not be authorized by submittals review actions.
 - 3. No review action by University's Representative or University's Consultants, implicit or explicit, shall be interpreted to authorize changes in the Work. Changes shall only be authorized by separate written Change Order, in accordance with the General Conditions of the Contract.
- B. University, University's Representative or University's consultants timely review of submittals and resubmittals.
 - 1. University, University's Representative or University's Consultants shall have fourteen (14) calendar days to review all submittals and an additional fourteen (14) days of review of all resubmittals.
 - 2. University, University's Representative or University's Consultant will prepare and keep log of review time of submittals.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01320

SECTION 01330
SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Administrative requirements for shop drawings, product data and samples submittals
- B. University's and University's Consultant's review of submittals
- C. Contractor's review of submittals
- D. Shop Drawing Submittals
- E. Product Data submittals
- F. Sample submittals
- G. Field Samples and mock-ups
- H. Submittal Schedule requirements

1.02 RELATED SECTIONS

- A. Section 01110 – SUMMARY OF THE WORK: Subcontractor and materials suppliers list.
- B. Section 01320 – CONTRACT SCHEDULES: Submission and review of schedules and submittals.
- C. Section 01450 – QUALITY CONTROL: Test and Inspection Reports.
- D. Section 01770 – CLOSEOUT PROCEDURES: Occupancy/Acceptance /Final Payment Submittals.
- E. Section 01780 – CLOSEOUT SUBMITTALS: Preparation of Maintenance and Operating Data.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. General Submittals Review: Submittals shall be made in accordance with requirements specified herein and in individual Sections.
 - 1. Submittals shall be a communication aid between Contractor, University's Representative, and University's Consultant(s) by which interpretation of Contract Documents requirements may be confirmed in advance of construction.
 - 2. Submit on all products to be used on the Project. Make all submittals through the University unless otherwise directed.
 - a. The University's Representative shall provide timely review of submittals and re-submittals.

- 1) University's Representative shall have fourteen (14) calendar days from receipt to review all standard submittals and fourteen (14) calendar days from receipt to review standard re-submittals.
 - 2) University's Representative & OSHPD shall have forty-five (45) calendar days from receipt to review all Deferred Design Submittals and forty-five (45) calendar days from receipt to review Deferred Design re-submittals.
 - 3) University's Representative will prepare and keep a log of review time of all submittals.
3. Substitutions shall be submitted in accordance with Section 01610 – PRODUCT REQUIREMENTS.
 4. Make submittals sufficiently in advance of construction activities to allow shipping, handling and review by the University's Representative and their consultants.
- B. University's and University's Consultants Review: University's Consultant's review will be only for general conformance with the design intent of the Contract Documents. Review of submittals is not conducted for purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. Review actions of the University's Consultant or University shall not relieve Contractor from compliance with requirements of the Contract Documents. Changes shall only be authorized by separate written Change Order in accordance with the General Conditions of the Contract.
- C. Contractors Review: Contractor shall review, mark-up as appropriate and stamp Shop Drawings, Product Data, and Samples prior to submission. Submittal shall clearly show it has been reviewed by Contractor for conformance with the Contract Documents and for coordination with requirements of the Work. Notify University's Representative in writing, at time of submission, of any changes in the submittals from requirements of Contract Documents.

1.04 SUBMITTAL REQUIREMENTS

- A. Prompt Submission: Submittals shall be submitted promptly in accordance with Submittal Schedule and in such sequence as to cause no delay in the Work or in the work of any separate contractor. Present information in a clear and thorough manner to aid orderly review.
- B. Preparation: Title each submittal with Project name and A/C number, submittal date and dates of any previous submissions. Clearly mark each copy to identify product or model.
1. Identify each item on submittal by reference to Drawing sheet number, detail, schedule, room number, assembly or equipment number, Specification number

Reference Standard (such as ASTM or Fed Spec Number) and other pertinent information to clearly correlate submittal with Contract Documents.

2. Include the names of the Contractor, Subcontractor, Supplier and Manufacturer.
3. Include field dimensions, clearly identified as such to establish relationship to adjacent or critical features of the Work or materials.
4. Include pertinent information such as performance characteristics and capacities, wiring or piping diagrams and controls, catalog numbers and similar data.
5. Modify manufacturer's standard schematic drawings and diagrams and other diagrams to delete information not applicable to the Work. Supplement standard information to provide information specifically applicable to the Work.
6. Identify changes from requirements of the Contract Documents.
7. Include 8" x 3" blank space on face of submittal for review stamps.
8. Include Contractor's review stamp, initialed or signed, and dated, certifying to the review of the submittal, verification of materials, field measurements, conditions, and compliance of the information within the submittal with the requirements of the Work and of the Contract Documents.

C. Number of submittals required:

1. **Product Data and Non-reproducible Submittals:** Submit the number of copies Contractor will need, plus five (5) copies for University use.
2. **Initial/Re-submitted Shop Drawing Review(s):** Submit eight (8) complete opaque reproductions for University's Representative review and comments.
3. **Final Shop Drawing Review and Approval:** After obtaining University's Representative approval of initial/re-submitted shop drawing submittals, as described in Section 1.04.C.2 above, Contractor shall submit one (1) reproducible transparency and two (2) opaque reproductions. After University's Representative final shop drawings approval is obtained, University will make all necessary prints for University's and will return reproducible transparency set to Contractor for their use. Contractor is responsible for providing all approved shop drawings for their use and their subcontractors and or suppliers use.
4. **Samples:** Submit number specified. Samples shall be of sufficient size and quality to clearly illustrate the functional characteristics of the products, with integrally related parts and attachment devices, including full range of colors, textures and patterns.

D. Identifying Submittals: Identify each submittal by Specification section number followed by a number indicating sequential submittal for that Section. Re-submittals shall use the same

Examples:

- F. Grouping of Submittals: Unless otherwise specifically permitted by University's Representative, make all submittals in groups containing all associated items as described

in each Specification Section. The University's Representative will reject partial submittals as incomplete.

- G. Unsolicited Submittals: Unsolicited submittals will be returned NOT REVIEWED.

1.05 DISTRIBUTION

- A. Reproduce and distribute finalized copies of Shop Drawings and Product Data, to the following:
1. Contractor's Project site file.
 2. Record Documents file maintained by Contractor.
 3. Pertinent Separate Contractors.
 4. Pertinent Subcontractors.
 5. Pertinent Supplier or Manufacturer.

1.06 FIELD SAMPLES AND MOCK-UPS - NOT USED

1.07 SUBMITTAL SCHEDULE

- A. Submittals Schedule: refer to Section 01320 – CONTRACT SCHEDULES.
1. The Submittal Schedule is a schedule for submission of Shop Drawings, Product Data and Samples by Contractor, and the processing and return of same by University.
 2. Contractor shall prepare the Submittal Schedule as described herein and coordinate it with the Contract Schedule. No submittals will be processed before the Submittal Schedule has been submitted to and accepted by University.
 3. Submittal Schedule shall be adjusted to meet needs of construction process and the Contract Schedule. Submit two (2) copies of the Submittal Schedule after it is completed and each time it is update by Contractor.
 4. Contractor shall NOT begin fabrication or Work which requires submittals until the return of final reviewed and approved submittals have been received by the Contractor.
 5. Allow 45 calendar days for Deferred Design Submittal reviews

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01330

SECTION 01340
CONTRACTOR(S) EMERGENCY PROCEDURES

PART I - GENERAL

- 1.01 The purpose of this specification is to outline, to the Contractor, the University's policy and procedures for effective project site management of an emergency situation during the construction of projects at the UC Davis Medical Center.
- 1.02 This procedure applies to all Contractors and their subcontractors who have contractual agreements with the UC Davis Medical Center.

PART II - DEFINITIONS

- 2.01 Disaster – any natural or human-made event that causes major disruption such as damage to the organization's buildings or grounds from severe weather conditions, earthquakes, other natural phenomena or loss of utilities (power, water and telephones), acts of civil disobedience, accidents or emergencies within the organization or in the surrounding community.
- 2.02 Code Green – a code notifying all employees that an emergency event (internal or external) has occurred and UCDMC operations will be immediately shifting to its emergency management mode. The terminology for a disaster occurring outside the Main Hospital facility is **CODE GREEN – EXTERNAL**, and for an incident occurring within, **CODE GREEN – INTERNAL**.
- 2.03 Code Green Alert – there will be times when UCDMC will have the opportunity to ready itself in advance of an emergency event (e.g., floods, work stoppage/strike, etc.). The Director (or designee) will place the hospital on a **CODE GREEN – ALERT**. During this alert status, departments will make immediate assessment of their on-site resources and prepare to augment those resources to ensure adequate levels of support are available.
- 2.04 Code Red – Fire
- 2.05 Code White – Hazardous Material / Chemical Spill
- 2.06 Control Facility – the County of Sacramento has designated UCDMC as the Control Facility for Sacramento County. The Control Facility coordinates medical control of patients and victims dispersal to hospitals in the community/region.
- 2.07 External Disasters – those disasters taking place in the community or region or in UCDMC facilities other than the Main Hospital, Trauma Nursing Unit (TNU) (Building 94) or Building 64.
- 2.08 Internal Disasters – those disasters taking place within the Main Hospital, TNU (Building 94) or Satellite Surgery Suite (SSS, Building 64).
- 2.09 Other emergency situations include the following systems failures as outlined in the UC Davis Emergency Response Plan.
 - A. Water system failure **PO&M Dispatch**
 - B. Telecom system failure – **Univ. Representative**
 - C. **Fire – standard hours Casey Irving, off-hours Fire/Police Dispatch**

- D. Electrical system failure PO&M Dispatch
- E. Security Fire/Police Dispatch
- F. Chemical spill – Env. Consultant
- G. Evacuation

PART III - PROCEDURES

3.01 The Contractor will be issued a UC Davis Medical Center Emergency Response Plan at the project

- A. Pre-construction meeting. This plan must be posted at the project site at all times in a visible location known to all project contractors.
- B. Contractor is directed to contact appropriate emergency personnel as outlined in the Emergency Response Plan information during an emergency.
- C. If the emergency involves an outside utility company, Contractor is to contact utility company directly. Known outside utilities located at the UC Davis Medical Center campus are as follows.

1. Emergency Telephone Numbers

a.	PO&M Dispatch (Electrical & Plumbing)	916-734-7456
b.	PG&E (Gas)	800-745-5000
c.	Campus Police Dispatch	916-734-2555

END OF SECTION 01340

**SECTION 01350
SPECIAL PROCEDURES**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Interim Life Safety Measures (ILSM)
- B. Security Procedures
- C. Hazardous Materials Procedures

1.02 RELATED SECTIONS

- A. General Conditions of the Contract
- B. Section 01110 – SUMMARY OF THE WORK
- C. Section 01310 – COORDINATION
- D. Section 01320 – CONTRACT SCHEDULES
- E. Section 01560 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS
- F. Section 01561 – AIRBORNE CONTAMINANTS CONTROL
- G. Section 01730 – CUTTING AND PATCHING
- H. Section 01740 – CLEANING

1.03 INTERIM LIFE SAFETY MEASURES (ILSM)

- A. ILSM Definition: Interim Life Safety Measures are those activities that are undertaken during construction, repair, and improvement operations that are established to temporarily compensate for the deficiencies caused in fire safety and protection that may be associated with such projects.
- B. Quality Assurance: Interim Life Safety Measures (ILSM) program shall comply with The Joint Commission Standards, Life Safety (LS) Section, LS.01.02.01.
 - 1. Contractor shall be responsible for setting up control procedures to adhere to ILSM Criteria Implementation Matrix and/or the ILSM Inclusion Criteria. Contractors shall notify University's Representative of anticipated and actual problems complying with ILSM.
 - 2. Contractor shall submit proposed Fire and Life safety impairments (21) days prior to implementation. Submittal of ILSM does not infer or guarantee acceptance by University. All submitted measures shall be reviewed and returned to Contractor indicating approval, approval as noted, or rejection, revision, or re-submittal requirement by University in writing no less than fourteen (15) calendar days prior to proposed implementation. If re-submittal is required, twenty-one (21) day review period from date of re-submittal will be required.

- C. Project ILSM Procedures: If a life safety code deficiency occurs, or is identified by any source, or the requirements of the current Life Safety Code are not being met; Interim Life Safety Measures must be implemented to the extent necessary to compensate for any deficient element(s) predicated on magnitude, severity, extent and duration before corrective actions are completed.

Any minor life safety code deficiency that could be corrected within 45 days that is confined to a single smoke compartment or fire zone will not merit for declaring a hospital-wide ILSM(s) but would require reduction in flammable and combustible loads in the affected smoke compartment or zone as well as issuing a work order to complete the Plan For Improvement (PFI) within 45 days of discovery.

The ILSM Criteria Implementation Matrix and/or the ILSM Inclusion Criteria forms completed by a University Representative are used to determine when and to what extent applicable ILSM measures as it pertains to each condition is required to be implemented. Based on the ILSM Inclusion Criteria assessment form, it may not be necessary to declare the need to implement ILSM measures under certain conditions as delineated in the form. When ILSMs are determined to be required, an ILSM Implementation Matrix shall be utilized by the contractor.

ILSMs must be implemented upon project development and must be continuously enforced through project completion. A comprehensive plan of correction is to be developed by the Project Representative, or designee using the ILSM Evaluation Form.

- D. Any impairment or shutdown of a passive or active fire and life safety device/system for a period of 4 hours or longer in a 24 hour period will require implementation of an ILSM. Some of the most common impairments are outlined below. The listing of these ILSM examples is not intended to limit or preclude preventative actions that may be required to temporarily compensate for other life safety deficiencies that may arise during construction activities due to unforeseen conditions, the contractor's changing work plan, or required continuing activities of University. Comments following each ILSM are known ILSM requirements at time of bid. These comments are made to assist Contractor in bid preparation and later preparation of ILSM plan for the Project. University makes no guarantee these comments address all conditions requiring action by Contractor.

1. ILSM example #1: Ensure exits provide free and unobstructed egress. Maintain free and unobstructed access and exits from all buildings to public ways. Maintain escape facilities for construction workers at all times. Inspect means of egress in construction areas daily.
2. ILSM example #2: Maintain free and unobstructed access to emergency departments/services.
3. ILSM example #3: Ensure fire alarm, detection, and suppression systems are not impaired.
4. ILSM example #4: Ensure temporary construction partitions are smoke tight and built of noncombustible or limit combustible material that will not contribute to the
5. ILSM example #5: Provide additional firefighting equipment and use training for construction workers.
6. ILSM example #6: No smoking. Contractor shall follow the Universities smoking policy.

7. ILSM example #7: Develop and enforce storage, housekeeping, and debris removal practices that reduce the flammable and combustible fire load of the building to the lowest level necessary for daily operations.
8. ILSM example #8: Conduct a minimum of two (2) fire drills per shift per quarter.
9. ILSM example #9: Conduct regular hazard surveillance of buildings, grounds, and equipment with special attention to excavations, construction areas, construction storage, and field office.
10. ILSM example #10: Train personnel when structural or compartmentalization features compromise fire safety measures.
11. ILSM example #11: Conduct organization-wide safety education programs to ensure awareness of any LSC (Life Safety Control) deficiencies, construction hazards, and ILSM.

1.04 SECURITY PROCEDURES

- A. Security Program: Protect Work, existing premises, and University operations from theft, vandalism, and unauthorized entry.
 1. Security of the area shall be strictly maintained. Contractor shall control entrance of persons and vehicles related to University operations.
- B. Entry Control: Restrict entry of persons and vehicles into Project site and existing facilities. Allow entrance only to authorized persons with proper identification. Maintain log of workers and visitors, make available to University's Representative.
 1. Contractor shall control entrance of persons and vehicles related to University operations.
- C. Personnel Identification: Provide identification card to each person authorized to enter premises, showing: Personal photograph, name and assigned number, expiration date, and employer. Maintain a list of accredited persons; submit copy to University's Representative on request.
- D. Miscellaneous Restrictions: Do not allow cameras on site; do not allow photographs except with written approval of University.

1.05 HAZARDOUS MATERIALS PROCEDURES

- A. Except as otherwise specified, should Contractor encounter site materials, reasonably believed to be asbestos, polychlorinated biphenyl (PCB), radioactive material, lead in paint, lead lining in walls or glass windows, lead in ceramic products, mold, water leaks or other hazardous materials or conditions, the Contractor shall immediately stop work in the affected area and report the condition to University's Representative in writing. The work in the affected area shall not thereafter be resumed except by written agreement of University and Contractor if in fact the material is identified as hazardous and has not been rendered harmless. The work in the affected area shall be resumed in the absence of hazardous materials, or when such materials have been rendered harmless.

- A. Spills, discharges, overruns, or similar occurrences involving hazardous materials on site shall be promptly reported in writing to University's Representative. If Contractor fails to notify University in a prompt and timely manner of an occurrence, University will contract with licensed hazardous materials abatement contractor to clean up the hazardous material. Contractor shall pay all costs of removal, including financial penalties incurred, the result of the Contractor's failure to act promptly in response to the product emergency.
- C. Contractor shall provide means and personnel to contain and control product emergencies, or shall provide means and methods to render hazardous materials harmless.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01350

SECTION 01390
GREEN BUILDING POLICY IMPLEMENTATION

PART I – GENERAL

1.01 SECTION INCLUDES

- A. Fundamental Building Systems Commissioning
- B. Construction Waste Management: Divert 80% from Landfill
- C. Construction Indoor Air Quality (IAQ) Management Plan: During Construction
- D. Environmental Product Declarations

1.02 RELATED DOCUMENTS AND SECTIONS

- A. Section 01560 – Temporary Barriers, Enclosures and Controls
- B. Section 01561 – Airborne Contaminants Control
- C. Section 01610 – Product Requirements
- D. Section 01740 – Cleaning
- E. Section 01750 – Starting and Adjusting Systems
- F. Section 01760 – Protecting Installed Construction
- G. Section 01770 – Closeout Procedures
- H. Section 01780 – Closeout Submittals
- I. Section 01810 – Plumbing/HVAC Testing Procedures
- J. Section 01820 – Demonstration and Training
- K. Section 02725 – Storm Drainage Water Quality
- L. Section 14240 – Hydraulic Elevators
- M. Section 14580 – Pneumatic Tube Systems
- N. Division 15 – Mechanical Work (All)
- O. Division 16 – Electrical Work (All)
- P. General Conditions

1.03 FUNDAMENTAL BUILDING SYSTEMS COMMISSIONING

- A. Commissioning is a systematic process of ensuring that all building systems and assemblies perform interactively according to University objectives and requirements and the design according to the contract documents. The commissioning process

encompasses and coordinates the traditionally separate functions of system documentation, equipment start-up, control system calibration, systems testing, testing and balancing, and training. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product. Commissioning during construction is intended to achieve the following specific objectives:

1. Ensure that applicable equipment, systems, and assemblies are installed according to the manufacturer's recommendations and to accepted industry standards, and that they receive adequate operational checkout by the Contractor.
 2. Ensure and document that equipment, systems, and assemblies function and perform according to University objectives and requirements and the Contract Documents.
 3. Ensure that operations and maintenance (O&M) manuals are complete.
 4. Ensure that University operating and maintenance personnel for all systems are adequately trained.
- B. Commissioning will be performed under the authority and management of the University Plant Operations & Maintenance Department (PO&M), as an independent organization whose individuals are not directly responsible for project design or construction management.
- C. Contractor Commissioning Responsibilities
1. Designate a Commissioning Coordinator to organize, schedule, and coordinate the execution of Contractor and subcontractor commissioning responsibilities.
 2. Ensure that commissioning activities are represented in the contract schedule.
 3. Notify the University when system testing for mechanical and electrical items, installations, and equipment per mechanical and electrical specifications will be conducted.
 4. Provide all labor, materials, and subcontractor support required for system testing and commissioning to the University.
 5. Attend and participate in commissioning planning and other associated meetings to facilitate the commissioning process.
 6. Provide additional documentation prior to normal O&M manual submittals to the University for development of installation, start-up, and testing procedures.
 7. Assist in clarifying the operation and control of commissioned equipment or assemblies in areas where the specifications, control drawings, or equipment documentation is not sufficient preparing testing procedures.
 8. Review test procedures developed by the University to ensure feasibility, safety, and equipment protection.
 9. Execute testing for selected systems and assemblies under the direction of the University.

10. Ensure that the local authorities having jurisdiction are present to witness any acceptance testing of systems that are a condition of building occupancy (fire alarm, fire damper, sprinkler system, etc.).
11. Train University personnel and prepare O&M manuals in accordance with the Contract Documents.

1.04 CONSTRUCTION WASTE MANAGEMENT: DIVERT 80% FROM LANDFILL

- A. Landfill Diversion Requirement: Divert 80% minimum of total project waste from landfill.
- B. Storage bins
- C. Submittals
 1. Waste Management Plan (WMP): Provide the following information:
 - a. Waste Material Estimating Sheet (Appendix A at the end of this Section): Project title, name of company which will implement the plan, and date.
 - b. Estimated job site waste to be generated, including types and quantities.
 - c. Proposed Alternatives to Landfilling: List each material planned to be salvaged or recycled, including quantities and proposed destination.
 2. Waste Management Progress Reports: Submit the following information to the UCDHS Sustainability Administrator on a monthly basis (information for June is due by July 20):
 - a. Waste Management Log (Appendix B at the end of this Section):
 - b. Project title, name of company completing report and dates of period covered by the report.
 - c. Date, destination, and quantity of each type of material landfilled, salvaged or recycled.
 - d. Weighmaster tickets can be substituted for items a and c (except for salvaged items). In all instances, weighmaster tickets must be provided with this submittal.
 - e. Alternative report formats may be acceptable, but must be reviewed and approved by the UCDHS Sustainability Administrator before being used in lieu of the requirements above.
 3. Legible copies of manifests, weight tickets, and receipts. Manifests shall be from recycling and/or disposal site operators that can legally accept the materials for the purpose of reuse, recycling or disposal.
 4. Maintain at the Project site Waste Management Logs for each load of materials removed from site.
- D. PROJECT MEETINGS
 1. Discuss Waste management plans and implementation at the following meetings:

- a. Pre-construction meeting.
- b. Regular job-site meetings.

E. PROJECT CONDITIONS

- 1. Hazardous materials are excluded from the work of this Section. If hazardous materials are encountered or suspected, stop work in the suspect area. Refer to Section 01350 Special Procedures.

F. CONSTRUCTION WASTE RECYCLING SERVICES

- 1. Construction waste recycling services for materials shall be those proposed by the Contractor and approved by the University.

G. The following may be suitable for diversion from landfill, though the Contractor and Contractor recyclers are responsible for final determination of suitable materials.

- 1. Concrete: Clean concrete, concrete with rebar, asphalt concrete.
- 2. Metals: Steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass or bronze, including banding, ductwork, framing, roofing and siding, flashing, piping and rebar.
- 3. Aggregate.
- 4. Wood: Clean dimensional wood, wood pallets, engineered wood products including plywood, particleboard, joists.
- 5. Vegetation.
- 6. Cardboard, paper, packaging.
- 7. Masonry: Brick, ceramic tile, CMU.
- 8. Gypsum board.
- 9. Acoustic ceiling panels.
- 10. Carpet and pad.
- 11. Paint.
- 12. Insulation.
- 13. Plastics: ABS, PVC
- 14. Beverage containers

H. WASTE MANAGEMENT PLAN IMPLEMENTATION

- 1. Coordinate waste materials handling and separation for all trades.
- 2. Document results of the implementation of the Waste Management Plan.

3. Provide separation bins for temporary onsite storage, handling, transportation, recycling, salvage, and landfilling for all demolition and waste materials.
4. Keep recycling and waste bins areas neat, clean and clearly marked in order to avoid contamination or mixing materials.
5. Maintain logs onsite for each load of materials removed from site.

1.05 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN: DURING CONSTRUCTION

- A. Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building including:
 1. Meet or exceed the recommended design guidelines of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines, 1995, Chapter 3. Compliance with SMACNA Guidelines shall start no later than the scheduled HVAC start up date. SMACNA Guidelines for HVAC protection and for protection of absorptive materials may need to start at an earlier stage, in accordance with the construction schedule.
 2. Protect stored on-site or installed absorptive materials from moisture damage.
 3. Comply with requirements of Section 15890 – Ductwork.
- B. Develop and implement an Indoor Air Quality Management Plan for the pre-occupancy phase.
 1. Comply with requirements of Section 15890 Ductwork.
- C. Submittals
 1. Construction Indoor Air Quality Management Plan.
 - a. Submit documentation demonstrating that an Indoor Air Quality Management Plan was developed and implemented, including:
 2. SMACNA IAQ Guidelines Chapter 3 implementation.
 3. Stored on-site or installed abortive materials were successfully protected from moisture damage.
 4. Maintaining ductwork internal cleanliness.
 5. Documentation including product data, that if any air handling systems were used during construction, that any return and exhaust grilles were protected with filtration media with a Minimum Efficiency Reporting Value (MERV) of at least 13 (per ASHRAE 52.2) including filtration media manufacturer's name, model number, and MERV value.
 6. Documentation, including product data, that all filtration media was replaced prior to occupancy with filtration media with a Minimum Efficiency Reporting Value (MERV) of at least 13 (per ASHRAE 52.2) including filtration media manufacture's name, model number, and MERV Value.
 7. Provide photographs verifying plan compliance at different phases of construction.

8. Submit documentation that a minimum two weeks building 100% outside air flush-out was completed, including dates when the flush-out was begun and completed and what steps were taken to guarantee 100% outside air usage.
9. Submit documentation for the filtration media used during the flush-out period, including filtration media manufacturer's name, model number, and MERV value.

D. Implementation

1. HVAC Protection

- a. Comply with Section 15890 – Ductwork

2. Source Control

- a. Prefabricated insulated ductwork and insulating materials should be protected against moisture. Ductwork materials shall be stored in a dry and clean environment pending installation.
- b. Containers of wet products shall be kept closed when not used. Waste materials that can release odor or dust shall be covered or sealed.

3. Housekeeping

- a. Minimize accumulation of dust fumes, vapors, or gases upon HVAC start up.
- b. Do not run the HVAC system until after dust generating finishes, such as spray applied fireproofing and gypsum board, have been installed.
- c. Suppress dust with wetting agents or sweeping compounds. Efficient and effective dust collecting methods such as damp cloths, wet mops, and vacuum with particulate filters, or wet scrubbers shall be used.
- d. Increase the cleaning frequency when dust build-up is noticed.
- e. Remove spills or excess applications of solvent-containing products as soon as possible.
- f. Also refer to Section 15890 – Ductwork for requirements.
- g. Water accumulated inside the building shall be removed promptly. Porous materials such as insulation, ceiling tiles, gypsum wall board, carpet and fabric furnishings shall be protected from exposure to moisture.
- h. Store volatile liquids, including fuels and solvents in closed containers and outside of the building when not in use.

4. Scheduling

- a. When possible, install carpets, furnishings and highly absorbent materials after all VOC-emitting products have been installed and fully cured.
- b. Provide sufficient ventilation and air circulation after VOC-emitting materials are installed.

- c. New MERV 13 filters shall be installed immediately following the flush and prior to building occupation. Refer to Section 15890 – Ductwork for additional requirements. Monitoring of IAQ Plan
- d. A minimum of 18 photographs, documenting the progress of the IAQ management Plan implementation, shall be taken at the following stages:
 - 1. Site delivery and storage processes
 - 2. Installation, protection, and housekeeping activities
 - 3. Commissioning, flushing, and re-filtering of HVAC systems

Enclose with each photograph a narrative identifying the date and location where the photograph was taken, and the SMACNA strategy applied.

- e. Subcontractor site coordination meetings shall be held monthly. The purpose of these meetings shall be to review the appropriate components of the IAQ Plan and to document the progress of the plan implementation. SMACNA IAQ Guidelines Appendix C shall be used as the Planning Checklist and Appendix D shall be used as the Inspection Checklist by the subcontractor.

5. Building Flush-Out

- a. Building flush-out and report: The subcontractor shall conduct a building flush-out and prepare a flush-out report. The flush-out report should include:
 - 1. Total days required and actual days conducted.
 - 2. Hours per day required actual hours conducted.
 - 3. Outside air percentage recommended and actual used.

PART II – PRODUCTS

2.01 ENVIRONMENTAL PRODUCT DECLARATIONS (EPD)

- A. Environmental Product Declarations are documents and other submissions required to be furnished by Contractor or a Subcontractor pursuant to California Public Contract Code Section 3500 et seq., the Buy Clean California Act (BCCA), as further described in the General Conditions. Contractor shall comply with the BCCA by providing EPDs to the University when utilizing any the following eligible materials for this project:
 - a. Flat glass.
 - b. Mineral wool board insulation.
- B. Contractors can search and download EPDs from the North American Program Operators websites below:
 - ASTM International: <https://www.astm.org/CERTIFICATION/EpdAndPCRs.html>
 - Embodied Carbon in Construction Calculator (EC3): <https://www.buildingtransparency.org/en/>
 - NSF International: https://info.nsf.org/Certified/Sustain/epd_search.asp

- Program Operator Consortium: <https://programoperators.org/>
- SCS Global Services: <https://www.scsglobalservices.com/certified-green-products-guide>
- Sustainable Minds Transparency Catalog: <https://www.transparencycatalog.com/>

PART III – EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION 01390

APPENDIX A
WASTE MATERIALS ESTIMATING SHEET
(Use as many sheets as needed)

PROJECT TITLE: _____

COMPANY: _____

DATE: _____

		TOTAL AMOUNT GENERATED	AMOUNT RECYCLED	AMOUNT SALVAGED	AMOUNT LANDFILLED
MATERIAL	DESTINATION	TONS	TONS	TONS	TONS
TOTALS					

APPENDIX B
WASTE MANAGEMENT LOG
(Use as many sheets as needed)

PROJECT TITLE: _____

COMPANY: _____

LOG DATES: _____ through _____

Date	Material	Destination	Tons			
			Salvaged	Recycled	Landfilled	Total
Totals						

Note: provide weighmaster tickets with specific information on type of material recycled and weight.

Project teams must, for projects entered into contract on or after January 1 2019 request, and on or after January 1 2020 require, EPDs for the four construction materials outlined below.

Instructions:

1. Go to the "UCOP Buy Clean" Box folder <https://ucop.box.com/s/wuh8vscfr0c5ea3l2zi2zjcz076hkjb>. Find your campus and create a folder for your project. Ensure only one folder per project.
2. Teams may upload EPDs during the course of construction or upon completion of construction.
3. Upon completion of each project, this form must be uploaded to the project folder along with all EPDs.
4. The project team must complete information for each project in the UCOP-EPD tracking file found here: <https://ucop.box.com/s/xh0kzrn2f6teqsnic5t7tos09m8ke67f>

Campus			
Project Name			
Name/ Title of Preparer			
Phone		Email	
Subst. Completion Date		TM1 Project ID	
Date Prepared		Total # EPDs	
# Structural Steel EPDs		# Flat Glass EPDs	
# Mineral Wool board insulation EPDs		# Carbon Steel Rebar EPDs	

EPD Certification – Confirm that each declaration submitted contains:		
Global Warming Potential (GWP) per material unit	☐ Yes	☐ No
Date of publication and period of validity	☐ Yes	☐ No
Confirmation of independent or 3 rd party verification	☐ Yes	☐ No
Explain any exceptions, or if any eligible materials were used which did not obtain an EPD:		

**SECTION 01410
REGULATORY REQUIREMENTS**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Relationship between Code, Ordinances, Standards and Contract Documents
- B. Applicable Codes, Laws and Ordinances
- C. Project Inspections
- D. Office of Statewide Health Planning & Development Projects

1.02 RELATED SECTIONS

- A. Section 01350 – SPECIAL PROCEDURES
- B. Section 01420 – REFERENCES
- C. Section 01450 – QUALITY CONTROL

1.03 RELATIONSHIP BETWEEN CODES, ORDINANCES, STANDARDS AND THE CONTRACT DOCUMENTS

- A. Authority: All codes, ordinances and standards referenced in Contract Documents shall have full force and effect as though printed in their entirety in the Contract Specifications.
- B. Precedence:
 - 1. Where specified requirements differ from requirements of applicable codes, ordinances and standards, the more stringent requirements shall take precedence.
 - 2. Where Contract Drawings or Contract Specifications require or describe products or execution of better quality, higher standard or greater size then required by applicable codes, ordinances and standards, the Contract Drawings and Contract Specifications shall take precedence so long as such increase is legal.
 - 3. Where no requirements are identified in Contract Documents, comply with all requirements of applicable codes, ordinances and standards of governing authorities having jurisdiction.

1.04 APPLICABLE CODES, LAWS AND ORDINANCES

- A. Building Codes:
 - 1. Work shall meet or exceed the requirements of and be performed in accordance with applicable code requirements and requirements of all other regulatory agencies, including, but not limited to the following:

- a. 2016 California Administrative Code, California Code of Regulations – Title 24, Part 1
- b. 2016 California Building Code, California Code of Regulations – Title 24, Part 2, Volume 1
- c. 2016 California Building Code, California Code of Regulations – Title 24, Part 2, Volume 2
- d. 2016 California Electrical Code, California Code of Regulations – Title 24, Part 3
- e. 2016 California Mechanical Code, California Code of Regulations – Title 24, Part 4
- f. 2016 California Plumbing Code, California Code of Regulations – Title 24, Part 5
- g. 2016 California Energy Code, California Code of Regulations – Title 24, Part 6
- h. 2016 California Elevator Safety Construction Code, California Code of Regulations – Title 24, Part 7
- i. 2016 California Historical Building Code, California Code of Regulations – Title 24, Part 8
- j. 2016 California Fire Code, California Code of Regulations – Title 24, Part 9
- k. 2016 California Existing Building Code, California Code of Regulations – Title 24, Part 10
- l. 2016 California Referenced Standards Code, California Code of Regulations – Title 24, Part 12
- m. 2016 NFPA 13 – Standard for the Installation of Sprinkler Systems
- n. 2016 NFPA 14 – Standard for the Installation of Standpipe and Hose System
- o. 2016 NFPA 72 – National Fire Alarm and Signaling Code
- p. 2016 NFPA 80 – Standard for Fire Doors and Other Opening Protectives
- q. 2018 NFPA 99 – Health Care Facilities Code
- r. 2018 NFPA 101 – Life Safety Code
- s. 2017 NFPA 252 – Standard Methods of Fire Tests of Door Assemblies
- t. 2015 NFPA 701 – Standard Methods of Fire Tests of Flame Propagation of Textiles and Films

- u. California Code of Regulations, Current Editions:
 - 1) Title 8, Industrial Relations
 - 2) Title 17, Public Health (Chapter 7)
 - 3) Title 19, Public Safety
 - 4) Title 21, Public Works
 - 5) Title 22, Social Security
 - 6) Title 24, Parts 1, 2, 3, 4, 5, 9 and 12
 - 7) Title 25, Energy Insulation Standards
 - v. Americans with Disabilities Act (ADA) 2010
 - w. OSHPD code applications notices and policy intent notices
 - x. Rules and regulations of private and public utilities
 - y. American National Standards Institute (ANSI)
 - z. American Society of Testing Materials (ASTM)
 - aa. Federal Specifications (Fed. Spec.)
 - bb. Underwriters Laboratories
 - cc. National Fire Protection Association (NFPA) (as adopted by State agencies)
 - dd. Traffic controls per California MUTCD requirements
- 2. All dates to comply with edition accepted by University and California State Fire Marshal (CSFM).
 - 3. Unless otherwise specified, specific references to codes, regulations, standards, manufacturers' instructions, or requirements of regulatory agencies, when used to specify requirements for materials or design elements, shall mean the latest edition of each in effect at the date of submission of bids, or the date of the Change Order, as applicable.
 - 4. References on Drawings or in Specifications to "code" or "building code" not otherwise identified shall mean the codes specified above, together with all additions, amendments, changes, and interpretations adopted by code authorities of the jurisdiction having authority over the project.
- B. Other Applicable Laws, Ordinances and Regulations:
- 1. Work shall be accomplished in conformance with all applicable laws, ordinances, rules and regulations of Federal, State and local governmental agencies and jurisdictions having authority over the Project.

2. Work shall be accomplished in conformance with all regulations of Public Utilities and utility districts.
3. Where such laws, ordinances, rules and regulations require more care or greater time to accomplish Work, or require better quality, higher standards or greater size of products, Work shall be accomplished in conformance to such requirements with no change to Contract Time or Contract Sum, except where changes in laws, ordinances, rules and regulations occur subsequent to execution date of the Agreement.
4. **GENERAL CONTRACTOR SHALL NOT SELF-PERFORM SPECIALTY CONTRACTING WORK DEFINED IN SECTIONS 7055 – 7059.1 OF THE CALIFORNIA BUSINESS AND PROFESSIONS CODE UNLESS THE GENERAL CONTRACTOR HAS THE SPECIALTY CONTRACTORS LICENSE APPROPRIATE FOR THE WORK PERFORMED. OTHERWISE, SPECIALTY CONTRACTORS SHALL BE RETAINED BY THE GENERAL CONTRACTOR TO PERFORM SPECIALTY WORK IDENTIFIED IN THE PROJECT SCOPE”.**

1.05 PROJECT INSPECTIONS

- A. Provision of inspectors by University, if any, or by Office of Statewide Health Planning and Development pursuant to this Section and Section 1.4 above shall be subject to the following:
 1. Contractor shall allow inspectors full access to Project at all times.
 2. Contractor shall not take any direction, approvals or disapprovals from inspectors.
 3. Contractor shall not rely on inspectors to ensure Work is completed in accordance with Contract Documents.
 4. Acts of omissions of any inspector (including without limitation inspector's failure to observe or report deficiencies in Contractor's Work) shall not relieve Contractor for responsibility to complete Work in accordance with Contract Documents.

1.06 OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT PROJECTS

- A. Office of Statewide Health Planning and Development (OSHDP), is the agency having jurisdiction over all acute care medical project design and construction unless a Memorandum of Understanding (MOU) has been established assigning University staff to perform regulatory duties.
- B. OSHDP will approve an inspector for the Project who shall have full access to the Project at all times.
- C. OSHDP will require Verified Report forms to be filed per testing, inspection and observation form during construction and a final verified report at completion of the project. Separate verified reports are required from Consultants, Project Inspector, and Contractor.
- D. OSHDP will require a Building Permit for project submitted by University's Representative. No OSHDP Building Permit fees are required to be paid by the Contractor.

- E. OSHPD will require Change Order Approval submitted by University's Representative.
- F. OSHPD will require a Licensed Contractor's Declaration from the Contractor.
- G. OSHPD projects shall comply with the 2016 California Administration Code.

1.07 DEFERRED APPROVAL

- A. Where noted in the Contract Documents, certain items of materials and/or systems may require OSHPD/SFM deferred approval pending submittals of shop drawings. For these items, Contractor shall submit details and structural calculations for anchorage, to comply with State of California Code of Regulations Title 24, table T17-23-J. Calculations shall be made by a licensed Structural Engineer registered in the State of California.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01410

**SECTION 01420
REFERENCES**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Definitions and terms used in Contract Documents
- B. Reference Standards used in Contract Documents
- C. Common abbreviations and acronyms which may be used in Contract Documents

1.02 RELATED SECTIONS

- A. Section 01410 – REGULATORY REQUIREMENTS

1.03 DEFINITIONS OF TERMS

- A. Basic Contract Definitions: Words and terms governing the Work are defined in the General Conditions of the Contract, provided in the Contract Documents.
- B. Additional words and terms are used in the Drawings and Specifications and are defined as follows:
 - 1. Applicable: As appropriate for the particular condition, circumstance or situation.
 - 2. Approve (d): Used in conjunction with action on submittals, applications, and requests, is limited to duties and responsibilities stated in the General Conditions. Approvals shall only be valid if obtained in writing and shall not apply to matters regarding the means, methods, techniques, sequences and procedures of construction. Approval shall not release Contractor from responsibility to fulfill Contract requirements.
 - 3. And/or: If used, shall mean that either or both of the items so joined are required.
 - 4. By others: Work on the project that is outside the scope of Work to be performed under the Contract, but that will be performed by University, separate contractors or other means.
 - 5. Contractor-Furnished/University-Installed (CFUI): Items, systems or equipment purchased by the Contractor as part of the project and handed over to the University for installation.

6. Directed: As instructed by University or University's Representative, in writing, regarding matters other than the means, methods, techniques, sequences and procedures of construction. Terms such as "directed", "requested", "authorized", "selected", approved, "required", and "permitted" mean "directed by University's Representative", requested by University's Consultant" or University's Representative and similar phrases. No implied meaning shall be interpreted to extend the University's Representative responsibility into Contractor's supervision of construction.
7. Equal or Equivalent: As determined by the University's Consultant as being of the same quality, appearance, utility, durability, finish, function, suitability, and performance.
8. Furnish: Means "supply and deliver, ready for unloading, unpacking, assembly, installation, and similar operations".
9. Indicated: Refers to graphic representations, notes or schedules on Drawings, or Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used, it is to help locate the reference.
10. Install: Describes operations at the site including unloading, unpacking, assembly, erection, anchoring, applying, working to dimension, protecting, cleaning, and similar operations.
11. Installer: "Installer" is the Contractor or an entity engaged by the Contractor, as an employee, subcontractor, or sub-subcontractor 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.
 - a. Experienced Installer: The term "experienced", when used with "installer" means having a minimum of five (5) previous Projects similar in size to this Project, and familiar with the precautions required, and with requirements of the authority having jurisdiction.
12. Jobsite: Same as site.
13. Necessary: as determined in the professional judgement of the University Representative through the University's Consultant as being necessary for the Work, in conformance with the requirements of the Contract Documents, and excluding matters regarding the means, methods, techniques, sequences and procedures of construction.
14. Noted: Same as indicated.
15. Owner-Furnished/Contractor-Installed (UFCI): Item, system or equipment furnished by University at its cost and installed by the Contractor as part of the Work.
16. Per: In accordance with or in compliance with.
17. Products: Materials, systems or equipment.
18. Project site: Same as site.

19. Proper: As determined by the University's Representative as being proper for the Work, excluding matters regarding the means, methods, techniques, sequences and procedures of construction, which are solely the Contractor's responsibility to determine.
20. Provide: Means "furnish and install, complete and ready for use".
21. Regulation: Includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, and rules, conventions and agreements within the construction industry that control performance of the Work, whether lawfully imposed by authorities having jurisdiction or not.
22. Required:
 - a. As required by regulatory requirements of governing authorities.
 - b. As required by referenced standards.
 - c. As required by existing job conditions.
 - d. As generally provided by accepted construction practices of the locale.
 - e. As indicated on the Drawings and in the Specifications.
 - f. As otherwise required by the Contract Documents.
23. Scheduled: Same as indicated.
24. Selected: As selected by University's Representative or University's Consultant from the full national product selection of the manufacturer, unless otherwise specifically limited in the Contract Documents to a particular quality, color, texture or price range.
25. Shown: Same as indicated.
26. Site: Same as Site of the Work or Project Site; the area or areas or spaces occupied by the Project and including adjacent areas and other related areas occupied or used by the Contractor for construction activities, either exclusively or with others performing other construction on the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land upon which the Project is to be built.
27. Testing Laboratories: Same as Testing and Inspection Agency.
28. Testing and Inspection Agency: An independent entity engaged to perform specific inspections or tests, at the Project Site or elsewhere, and to report on, and, if required, to interpret, results of those inspections or tests.
29. University-Furnished/Contractor-Installed (UFCI): Same as Owner-Furnished/Contractor-Installed.

1.04 REFERENCE STANDARDS

- A. References: The Drawings and Specifications contain references to various standards, standard specifications, codes, practices and requirements for products, execution, tests, and inspections. These reference standards are published and issued by the agencies, associations, organizations and societies listed in this Section or identified in individual Sections of the Specifications.
- B. Relationship to Drawings and Specifications: Such references are incorporated into and made a part of the Drawings and Specifications to the extent applicable.
- C. Referenced grades, Classes and Types: Where an alternative or optional grade, class or type of product or execution is included in a reference but is not identified in the Drawings or Specifications, provide the highest, best and greatest of the alternatives or options for the intended use and prevailing conditions.
- D. Copies of Reference Standards:
 - 1. Reference standards are not furnished with the Drawings and Specifications. It is the responsibility of the Contractor, subcontractors, manufacturers, suppliers, trades and crafts to be familiar with these generally recognized standards of the construction industry.
- E. Jobsite Copies:
 - 1. Contractor shall obtain and maintain at the Project site copies of reference standards identified on the Drawings and in the Specifications in order to properly execute the Work.
- F. Edition Date of References:
 - 1. When an edition or effective date of a reference is not given, it shall be understood to be the current edition or latest revision published as of the date of the Contract.
 - 2. All amendments, changes, errata, and supplements as of the effective date shall be included.
- G. ASTM and ANSI References: Specifications and Standards of the American Society for Testing and Materials (ASTM) and the American National Standards Institute (ANSI) are identified in the Drawings and Specifications by abbreviation and number only and may not be further identified by title, date, revision or amendment. It is the responsibility of the Contractor to be familiar with and have access to these nationally, and industry recognized specifications and standards.

1.05 ABBREVIATIONS & ACRONYMS

- A. Abbreviations and Names: Where acronyms or abbreviations are used in the Specifications or other Contract Documents they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction or other entity applicable.
- B. Refer also to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.

C. The following are commonly used abbreviations which may be found on Contract Drawings and in Contract Specifications:

AA	Aluminum Association
AAA	American Arbitration Association
AAC	Architectural Anodizers Council
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ACPA	American Concrete Pumping Association
ADA	Americans with Disabilities Act
ADC	Air Diffusion Council
AFSA	American Fire Sprinkler Association
AGA	American Galvanizers Association (formerly AHDGA)
AGA	American Gas Association
AGC	Associated General Contractors of American
AI	Asphalt Institute
AIA	American Institute of Architects
AIMA	Acoustical and Insulation Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association International
ANSI	American National Standards Institute
APA	Engineered Wood Association (formerly American Plywood Association)
APWA	American Public Works Association
ARMA	Asphalt Roofing Manufacturers Association
ASAC	American Subcontractors Association of America
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BOC	Board of Corrections
CABO	Council of American Building Officials
CAC	California Administrative Code (see California Code of Regulations (CCR))
CAL/OSHA	State of California Construction Safety Orders
CBC	California Building Code
CCR	California Code of Regulations
CEC	California Electrical Code
CFC	California Fire Code
CFR	Code of Federal Regulations
CIMA	Construction Industry Manufacturers Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers' Institute
CMC	California Mechanical Code
CPC	California Plumbing Code
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
CTIOA	Ceramic Tile Institute of America, Inc.
DHI	Door and Hardware Institute
DSA	Division of the State Architect
EJMA	Expansion Joint Manufacturers Association
FGMA	Flat Glass Marketing Association
FM	Factory Mutual Research Organization
FS	Federal Specification (from GSA)
GA	Gypsum Association
GSA	General Services Administration
IAPMO	International Association of Plumbing and Mechanical Officials
IEEE	Institute of Electrical and Electronics Engineers, Inc.

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ISO	International Organization for Standardization
MIA	Masonry Institute of America
ML/SFA	Metal Lath/Steel Framing Association
MM	State of California, Business and Transportation Agency, Department of Transportation, "Materials Manual"
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMM	National Association of Architectural Metal Manufacturers
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFC	National Fire Code
NFPA	National Fire Protection Association
NFSA	National Fire Sprinkler Association
NGA	National Glass Association
NIBS	National Institute of Building Sciences
NIST	National Institute of Standards and Technology
NPCA	National Precast Concrete Association
NRCA	National Roofing Contractors Association
NSC	National Safety Council
NSF	National Sanitation Foundation
NSPE	National Society of Professional Engineers
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
OSHPD	Office of Statewide Health Planning and Development (State of California)
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting and Decorating Contractors of America
PDI	Plumbing and Drainage Institute
PS	Product Standard (U.S. Department of Commerce)
RIS	Redwood Inspection Service
SDI	Steel Deck Institute
SFM	State Fire Marshal (California)
SFPE	Society of Fire Protection Engineers
SGCC	Safety Glazing Certification Council
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Society for Protective Coatings (Steel Structure Painting Council)
SSPWC	Standard Specifications for Public Works Construction
SWRI	Sealant, Waterproofing and Restoration Institute
TCA	Tile Council of America
TJC	The Joint Commission
UBC	Uniform Building Code
UFC	Uniform Fire Code
UL	Underwriters Laboratories, Inc.
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
USS	United States Standard
WCLIB	West Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association

D. Words and terms not otherwise specifically defined in this Section or in the Contract Documents, shall be as customarily defined by trade or industry practice, by reference standard and by specialty dictionaries such as Dictionary of Architecture and Construction (Cyril M. Harris, McGraw-Hill Educational; 4th Edition, September 5, 2005).

E. Additional abbreviations, used on the Drawings, are listed thereon.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01420

**SECTION 01450
QUALITY CONTROL**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Contractor's Quality Control
- B. Quality of the Work
- C. Inspections and tests by governing authorities
- D. Inspections and tests by serving utilities
- E. Inspections and tests by manufacturer's representatives
- F. Inspections and Independent testing and Inspection Laboratories/Agencies
- G. Contractor responsibilities in inspections and tests
- H. Contractor responsibilities regarding UCDMC testing laboratory
- I. Test reports
- J. Geotechnical engineer

1.02 RELATED SECTIONS

- A. Section 01310 – COORDINATION
- B. Section 01410 – REGULATORY REQUIREMENTS: Compliance with applicable codes, ordinances and standards.
- C. Section 01455 – INSPECTION OF WORK
- D. Section 01610 – PRODUCT REQUIREMENTS: Product Options, substitutions, transportation and handling requirements, storage and protection requirements, and system completeness requirements.

1.03 CONTRACTOR'S QUALITY CONTROL

- A. Contractor's Quality Control: Contractor shall ensure that products, services, workmanship and site conditions comply with requirements of the Contract Documents by coordinating, supervising, testing and inspecting the Work and by utilizing only suitably qualified personnel.
- B. Quality Requirements: Work shall be accomplished in accordance with quality requirements of the Contract Documents, including, by reference, all Codes, laws, regulations and standards. When no quality basis is prescribed, the quality shall be in accordance with the best-accepted practices of the construction industry for the locale of the Project, for projects of this type.

- C. Quality Control Personnel: Contractor shall employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure the Work is provided as required.

1.04 QUALITY OF THE WORK

- A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects and fit for the intended use.
- B. Quality of Installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements.
- C. Protection of Completed Work: Take all measures necessary to preserve completed Work free from damage, deterioration, soiling and staining, until Acceptance by University.
- D. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report (ICC) requirements in preparing, fabricating, erecting, installing, applying, connecting and finishing Work.
- E. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviation is acceptable and appropriate for the Project.
- F. Verification of Quality: Work shall be subject to verification of quality by University's Representative and University's Consultant in accordance with provisions of the General Conditions of the Contract.
 - 1. Contractor shall cooperate by making Work available for inspection by University's Representative, University's Consultant or their designated representatives.
 - 2. Such verification may include mill, plant, shop, or field inspection as required.
 - 3. Provide access to all parts of the Work, including plants where materials or equipment are manufactured, fabricated or stored.
 - 4. Provide all information and assistance as required, including that by and from subcontractors, fabricators, materials suppliers and manufacturers, for verification of quality by University's Representative or University's Consultant.
 - 5. Contract modifications, if any, resulting from such verification activities shall be governed by applicable provisions in the General Conditions of the Contract.
- G. Observations by University's Consultants: Periodic and occasional observations of the Work in progress will be made by University's Consultant and their consultants as deemed necessary to review progress of Work and general conformance with design intent.

- H. Limitations on Inspections, Tests and Observations: Neither employment of independent testing and inspection agencies nor observations by University's Consultant and their consultants shall relieve Contractor of obligation to perform Work in full conformance to all requirements of Contract Documents.
- I. Acceptance and Rejection of Work: University's Representative reserves the right to reject all Work not in conformance to the requirements of the Contract Documents.
 - 1. If initial tests or inspections made by University's Testing Laboratory or University's Geotechnical Engineer reveal any portion of the Work fails to comply with Contract Documents, or if it is determined that any portion of Work requires additional testing or inspection, additional tests and inspections shall be made as directed by University's Representative.
 - 2. If such additional tests or inspections establish such portions of the Work comply with Contract Documents, all costs of such additional testing or inspection will be paid by University.
 - 3. If such additional tests or inspections establish such portions of the Work fail to comply with Contract Documents, all costs of such additional tests and inspection shall be deducted from the Contract sum.
- J. Correction of Non-conforming Work: Non-conforming Work shall be modified, replaced, repaired or redone by Contractor at no change in the Contract Sum or Contract time.
- K. Acceptance of Non-Conforming Work: Acceptance of non-conforming Work, without specific written acknowledgement and approval of University shall not relieve Contractor of the obligation to correct such Work.
- L. Contract Adjustment for Non-conforming Work: Should University or University's Consultants determine it is not feasible or in University's interest to require non-conforming Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between University and Contractor. If equitable reduction in Contract Sum cannot be agreed upon, a Directed Change Order will be issued and the amount in dispute resolved in accordance with applicable provisions of the General Conditions of the Contract.

1.05 INSPECTIONS AND TESTS BY GOVERNING AUTHORITIES

- A. Regulatory Requirements for Testing and Inspection: Comply with California Building Code (CBC) requirements and all other requirements of governing authorities having jurisdiction.
- B. Inspections and tests by governing Authorities: Contractor shall cause all tests and inspections required by governing authorities having jurisdiction to be made for Work under this Contract.
 - 1. Such authorities include University's Building Inspection (code compliance), University's Fire Marshal's office and similar agencies.

1.06 INSPECTIONS AND TESTS BY SERVING UTILITIES

- A. Inspections and Tests by Serving Utilities: Contractor shall cause all tests and inspections required by serving utilities to be made for Work under this Contract. Scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.

1.07 INSPECTIONS AND TEST BY MANUFACTURER'S REPRESENTATIVES

- A. Inspections and Tests by Manufacturer's Representatives: Contractor shall cause all tests and inspections specified to be conducted by materials or systems manufacturers, to be made. Additionally, all tests and inspections required by materials or systems manufacturers as condition of warranty or certification of Work shall be made, the cost of which shall be included in the Contract Sum.

1.08 INSPECTION BY INDEPENDENT TESTING AND INSPECTION LABORATORIES

- A. Definitions:
1. The term "University's Testing Laboratory" means a testing laboratory retained and paid for by University for the purpose of reviewing material and product reports, performing material and product testing and inspection, and other services as determined by University.
- B. University will select an independent testing and inspection laboratory or agency to conduct tests and inspections as called for in the Contract Documents and as required by governing authorities having jurisdiction.
1. Responsibility for payment for tests and inspection shall be as indicated in the schedule below. All time and costs for Contractor's services related to such tests and inspections shall be included in Contract Time and Contract Sum.
- C. Contractor shall notify University, and if directed by University's Representative testing and inspection laboratory, when Work is ready for specified tests and inspections.
- D. Contractor shall pay for all additional charges by testing and inspection agencies and governing authorities having jurisdiction due to the following:
1. Contractor's failure to properly schedule or notify testing and inspection agency or authority having jurisdiction.
 2. Changes in sources, lots or suppliers of products after original tests or inspections.
 3. Changes in means, methods, techniques, sequences and procedures of construction that necessitate additional testing, inspection and related services.
 4. Changes in mix designs for concrete and mortar after review and acceptance of submitted mix design.

- E. Test and inspections shall include, but not be limited to, the following:

Material Inspections and Tests Paid by:

Spray Fireproofing	Install Certifications/Install	University
	Adhesion & Cohesion	University
Post-Installed Anchors	Torque Test	University
	Pull Tests	University
Div. 05 Steel	Material Identification	University
Div. 05 Steel & MEP Supports	Welding Inspection	University

- F. Test and Inspection Reports: After each inspection and test, one (1) copy of report shall be promptly submitted to University's Representative, Contractor and to agency having jurisdiction (if required by code).

1. Reports shall clearly identify the following:
 - a. Date issued
 - b. Project name and Project number
 - c. Identification of product and Specification Section in which Work is specified
 - d. Name of inspector
 - e. Date and time of sampling or inspection was conducted
 - f. Location in Project where sampling or inspection was conducted
 - g. Type of inspection or test
 - h. Date of tests
 - i. Results of tests
 - j. Comments concerning conformance with Contract Documents and other requirements
2. Test reports shall indicate specified or required values and shall include statement whether test results indicate satisfactory performance of products.
3. Samples taken but not tested shall be reported.
4. Test reports shall confirm that methods used for sampling and testing conform to specified test procedures.
5. When requested, testing and inspection agency shall provide interpretations of test results.
6. Verification reports shall be prepared and submitted, stating tests and inspections specified or otherwise required for Project, have been completed and

material and workmanship comply with the Contract Documents. Verification reports shall be submitted at intervals not exceeding six (6) months, at Substantial Completion of the Project, and at all times when Work of Project is suspended.

1.09 CONTRACTOR RESPONSIBILITIES IN INSPECTIONS AND TESTS

- A. Tests, inspections and acceptances of portions of the Work required by the Contract Documents or by Applicable Code Requirements shall be made at the appropriate times. Except as otherwise provided, Contractor shall notify University's Representative to make arrangements for such tests, inspections and acceptances. Contractor shall give University's Representative timely notice of all required inspections as outlined in Specification Section 01455 – INSPECTION OF WORK, Item 1.05, Scheduling Inspections – Notification Requirements.
- B. If such procedures for testing, inspection or acceptance reveal failure of any portion of the Work to comply with requirements of the Contract Documents, Contractor shall bear all costs made necessary by such failure including those of repeated procedures, including compensation for University's Consultant's services and expenses.
- C. If University and/or University's Consultants are to observe tests, inspections or make acceptances required by the Contract Documents, University and/or University's Consultant will do so promptly and, where practicable, at the normal place of testing.
- D. Cooperate with testing and inspection agency personnel, University, University's Consultant's and their consultants. Provide access to Work areas and off-site fabrication and assembly locations, including during weekends and after normal work hours.
- E. Provide incidental labor and facilities to provide safe access to Work to be tested and inspected, to obtain and handle samples at the Project site or at source of products to be tested, and to store and cure test samples.

1.10 CONTRACTOR RESPONSIBILITIES REGARDING UCDCM TESTING LABORATORY

- A. Secure and deliver to University's Testing Laboratory adequate quantities of representative samples of materials proposed for use as specified.
- B. Submit to University's Representative the preliminary design mixes proposed for concrete and other materials, which require review, by University's Consultants and/or University's Testing Laboratory.
- C. Submit copies of product test reports as specified.

1.11 TEST REPORTS

- A. University's Testing Laboratory shall submit one (1) copy of all reports to University's Representative, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- B. University will distribute one (1) copy of the reports to University's Consultants and Contractor.

1.12 GEOTECHNICAL ENGINEER - NOT USED

- A. University will retain and pay the expense of a Geotechnical Engineer to perform inspection, testing and observation functions specified by University. Geotechnical Engineer will communicate only with University. University's Representative shall then give notice to Contractor, of any action required of Contractor.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01450

SECTION 01451
SEISMIC CONTROL – OSHPD

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide all required seismic restraints and calculations in order to insure that the installation of all architectural, mechanical, and electrical equipment/components are in compliance with all applicable seismic codes, standards, and specific information listed herein.

1.02 QUALITY ASSURANCE

- A. ASTM standards
- B. 2019 California Building Code, Title 24 (CBC)

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of material listed in this Section.
- B. Submit special seismic certification (OSP) for mechanical and electrical equipment/components as noted on CBC 1705A.13.3.1. Contractor shall bear all costs associated with any and all tests, engineering calculations and documentation required to obtain OSHPD approval in accordance with this section in a timely manner if the Contractor chooses to select equipment that does not already have special seismic certification as noted on the design documents.
- C. Submit OSHPD Pre-approved Manufacturer's Certification (OPM) as noted on the design drawings.

PART 2 - PRODUCTS

2.01 SEISMIC RESTRAINT REQUIREMENTS

A. SUMMARY

- 1. This section covers the seismic restraint requirements for suspended distribution systems, vibration and non-vibration isolated items, systems and/or related suspended equipment.
- 2. The designers of record (DOR) as referenced in this specification shall be the project architect, structural engineer and the appropriate system engineer (e.g., electrical, etc.).
- 3. An OSHPD OPM determined by the DOR shall be considered as the specified seismic design for this project. Other designs may be submitted as an alternate provided that they meet or exceed all of the requirements contained within these specifications, OSHPD pre-approved service loads, installation applications, and engineering services.

B. SEISMIC RESTRAINT DESIGN

1. The attachment, supports and seismic restraints of suspended non-structural components and distribution systems listed below shall be designed to resist the total design seismic forces prescribed in the CBC.
 - a. All equipment/components including but not limited to: electrical, mechanical, plumbing, and architectural.
 - b. Without referencing OPM or OSHDP pre-approved seismic attachment and supports shown on the design document, seismic support and attachment shall be engineered and built by the applicable system contractor. Engineering shall be performed (signed & sealed) by a licensed California Structural Engineer and submitted to the DOR and OSHDP for acceptance prior to installation. Cost to be borne by the contractor.
 - c. Design and installation shall consider seismic relative displacement in accordance with ASCE 7-16-13.3.2.
 - d. Pipes with hazardous contents including but not limited to medical gas, fuel oil, natural gas piping larger than 1-inch diameter shall be seismically braced per the OPM or OSHDP pre-approved design.
2. Seismic restraint transverse and/or longitudinal spacing shall be in accordance with CBC and OPM and limited to the following;
 - a. Seismic design forces equal to or less than the capacity of the building structure.
 - b. 40' feet transversely and/or 80' feet longitudinally where pipes, conduits, and their connections are constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections).
 - c. 20' feet transversely and/or 40' feet longitudinally where pipes, conduits, and their connections are constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic).
 - d. 20' feet transversely and/or 40' feet longitudinally for bus ducts and cable trays, baskets, channels.
3. Contractor shall not adopt, use or otherwise implement the omission of any seismic restraints without prior review and acceptance by the designers of record. All submittals for omission of seismic restraints must include the following, and must be performed (signed & sealed) by a licensed California Structural Engineer and approved by OSHDP;
 - a. Project specific cover letter clearly indicating that said engineer has completely reviewed the project documents, and that the items/systems were designed individually and in coordination with all other trades, and references the code section(s) where the omission of seismic restraints is allowed.

- b. Lateral motion of the supported items/systems shall not directly or indirectly impact adjacent life safety, emergency services and/or hazardous items/systems or their supports.
 - 4. Seismic hardware brackets shall provide a (Captive) 360-degree connection that completely encloses or encircles the rod, anchor, bolt, fastener, etc. Open hook and/or open slot seismic hardware brackets shall not be allowed.
 - 5. Seismic restraint assembly connections shall not incorporate the use of break-off bolts or nuts and pneumatic fasteners unless referenced in the OPM document.
 - 6. Ceiling system shall not be used as a seismic restraint, sway brace and/or safety restraint material.
 - 7. Non-seismic and/or safety restraints sway bracing shall meet or exceed that required for the attachment of seismic restraints to the building structure.
 - 8. Seismic restraints shall be installed to provide a minimum of (2) two transverse and (1) one set of (2) two longitudinal braces per run and per the OPM document.
 - 9. The accumulated load of multiple items at any given support (with or without seismic restraints) shall not overload the building structure and the support assembly.
 - 10. Pipes, conduits, and other items attached to trapeze hangers shall be located uniformly along each individual trapeze hanger so that the accumulated load is evenly distributed.
 - 11. Trapeze systems installed in a multi-layer configuration shall have seismic restraints designed and installed for each individual trapeze layer.
 - 12. Design of supports, seismic restraints and anchorage to the structure shall consider all conditions that involve thermal, structural separation, relative displacement, building expansion and contraction.
 - 13. SMACNA details shall not be used without prior approval by Structural Engineer of Record (SEOR).
- C. ACCEPTABLE MANUFACTURERS
- 1. OSHDP Pre-approved Certified Manufacturer (OPM)
- D. ANCHORS, INSERTS AND FASTENERS
- 1. All anchors, inserts, fasteners or connections to the structure shall be submitted to the structural engineer of record for review and acceptance prior to installation.
 - 2. Do not use any anchor or insert in concrete or metal decking with concrete fill, which does not have one of the following:
 - a. ICC evaluation report
 - b. OSHDP pre-approval

3. Cast-in-place inserts that contain internal threads shall include the installation of a jam or lock nut to secure the connection of the vertical support rod to the cast-in-place insert.
4. Cast-in-place inserts that allow for horizontal adjustment shall not be allowed, unless an engineered solution is provided to assure positive captured positioning and secured attachment.
5. Do not use powder driven and power driven (Shoot-In) fasteners, expansion nails or internally threaded anchors in concrete or metal decking with concrete fill without prior approval of the Project Manager and verifying that the embedment depth will not damage any buried conduits or piping.
6. All beam clamps shall be constructed of malleable iron or steel. All single flange mounted beam clamps shall include a retaining strap or J-hook and must be submitted to the project structural engineer of record of review and acceptance prior to installation. Beam clamps shall not be used to resist seismic loads.

E. FIELD QUALITY CONTROL

1. Inspection of seismic restraints by the Inspector of Record (IOR), and/or Authority Having Jurisdiction (AHJ).
2. Special inspection for special seismic certification per CBC 1705A.12.4.

PART 3 - EXECUTION

3.01 SEISMIC ANCHORING AND RESTRAINTS

A. Equipment anchors:

1. All equipment shall be anchored. Anchor equipment per details shown on the drawings where provided.
2. Anchor installation shall be in accordance with the current ICC report.
3. Anchor details provided are based on specific equipment information. Submit design for approval for anchoring of equipment which varies from design.

B. Conduit supports:

1. Conduits shall be supported and braced per CBC.

C. Lighting fixture supports:

1. Provide independent seismic support system per CBC.

D. Minimum clearance:

1. Diagonal braces and hanger supports shall maintain 6 inches minimum clearance from unbraced ducts and conduits, and 1 inch minimum clearance from braced ducts and conduits.
2. Except for sprinklers installed using flexible sprinkler hose, installed clearance

shall be 3 inches between any sprinkler drop or sprig and permanently attached equipment and other distribution systems, including their structural supports and bracing.

3.02 INSTALLATION AND TESTING OF MECHANICAL ANCHORS:

- A. Where permitted in other Sections of this specification, drilled-in expansion-type anchors or other post-installed concrete anchors may be used in hardened concrete.
- B. All post-installed concrete anchors shall be tested. Testing shall be performed in the presence of the Inspector of Record. Number of anchors to be tested shall be as shown on the drawings with a minimum of 50% of anchors installed and at each support. Testing shall be performed by torque or pull test, and to the values noted on the drawings. Test loads, frequency and acceptance criteria of post-installed anchors in concrete shall be in accordance with CBC 1910A.5.
- C. Internally threaded shell-type anchors and displacement controlled anchors (e.g., drop-in anchors, screw anchors, adhesive anchors, etc.) shall not be tested using a torque wrench.
- D. Screw anchors shall be installed with a calibrated torque wrench and may be loosened a maximum of one full turn to facilitate the positioning of a tension test collar. Following the tension test, the anchor shall be re-torqued in accordance with the manufacturer's installation instructions.
- E. Tension test of chemical/adhesive anchors and power actuated fasteners shall be in accordance with CBC and as noted on the drawings.
- F. All testing procedures shall be in accordance with CBC 1910A.5, and as noted on the drawings.
- G. Locate existing reinforcing steel and conduits in slabs and walls prior to drilling holes for the mechanical anchors.

END OF SECTION 01451

SECTION 01455
INSPECTION AND TESTING OF WORK

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Project Inspections and Procedures
- B. Scheduling Inspectors – Notification requirements

1.02 RELATED SECTIONS

- A. Section 01310 – COORDINATION
- B. Section 01320 – CONTRACT SCHEDULES
- C. Section 01350 – SPECIAL PROCEDURES
- D. Section 01410 – REGULATORY REQUIREMENTS
- E. Section 01450 – QUALITY CONTROL

1.03 DEFINITIONS

- A. IOR: Inspector-of-Record
- B. ACO: Area Compliance Officer for OSHPD
- C. DSE: District Structural Engineer for OSHPD
- D. FM: Fire Marshal (may include both OSHPD FM and State FM)
- E. TL: Testing Laboratory

1.04 PROJECT INSPECTIONS AND TESTING PROCEDURES

- A. Inspections: This Project is under the jurisdiction of the Office of Statewide Health Planning and Development. The following inspections will be requested on this project, as appropriate. See Part 3, Item 3.11 for OSHPD requirements.
 - 1. Inspections required by the California Building Code
 - 2. Inspections listed on the Testing, Inspection and Observation (TIO) form
 - 3. Final inspections
- B. Procedures: University's Representative shall be the Contractor's contact for all inspection requests. Contractor shall fill out Inspection Request Form for all inspections.
 - 1. Contractor shall properly plan and coordinate inspection requests. Schedule delays caused by Contractor's failure to plan and/or coordinate inspection

requests will not be considered for adjustments to Contract Time or Contract Sum.

2. A complete set of OSHDP/SFM stamped and approved Contract Drawings and Contract Specifications, including applicable shop drawings and building permit shall be available on site for review by the Inspector-of-Record. The Contractor, Subcontractors and other responsible parties shall be present during inspection walk-throughs. All areas of project scope shall be ready and accessible for inspection. Contractor shall provide access equipment as applicable for the inspector's needs.
3. A complete set of codes referred to in the approved plans must be maintained on the job at all times.
4. Contractor shall submit verified compliance reports as outlined in the California Administrative Code, Section 7-151.

1.05 SCHEDULING INSPECTIONS – NOTIFICATION REQUIREMENTS

A. Advance Inspection Notification: University's Representative for this project requires the following advance notifications to schedule appropriate inspection agencies at the project site.

1. IOR Inspection Request Notification: Twenty-four (24) hours. Note: Inspection requests received by 2:00 PM will be scheduled for next day inspection. Inspection requests received after 2:00 PM will be scheduled for the following day; (example: Inspection request received at 2:01 PM on a Monday would be scheduled for inspection on Wednesday). Weekend and off-hours inspection requests will be scheduled on a case-by-case basis with a minimum of seventy-two (72) hour inspection request notification.
2. OSHDP Field Compliance Inspectors: Fourteen (14) calendar days.
3. Testing Laboratory Inspections: Twenty-four (24) hours.
 - a. All testing laboratory and testing procedures must be scheduled by University's Representative. Inspections and/or testing directly scheduled by Contractor will not be accepted.
 - b. Contractor will bear all costs associated with unauthorized inspections and testing.
4. State Fire Marshal Inspection request Notification: Seventy-two (72) hours.

B. Methods of Inspection Notification:

1. All inspection notifications shall be in writing using inspection forms located at back of this Section. Incomplete forms will be returned as non-compliant and no inspection will be scheduled until all required inspection information is provided.
2. Faxed inspection requests will be accepted. University's Representative fax number is 916-734-1375 notification time begins from date stamp of University's fax machine. Faxed notification requests received after normal business hours and/or received on non-normal workdays, as defined in Specification Section

01310 – COORDINATION, paragraph 1.07.F.4.A will begin notification time starting at 7:00 AM the following normal business day.

3. Emailed inspection requests will be accepted. University's Representative email address is fdc.inspectors@ucdmc.ucdavis.edu. Notification time begins from the date and stamp of the email, provided it is sent during normal business hours. Emailed inspection requests sent after normal business hours and/or received on non-normal workdays, as defined in Specification Section 01310 – COORDINATION, paragraph 1.07.F.4.A will begin notification time starting at 7:00 AM the following normal business day.
- C. Off-hours Inspection Requests: Contractor shall provide time windows for all off-hour or other than normal work hour inspections. University's Representative shall have final authority in setting times of off-hour inspections.
- D. Re-inspections:
 1. More than two (2) re-inspections: The cost of re-inspections of the same work, more than twice, shall be deducted from Contract Sum. IOR's hourly rates are \$153.00 per hour during normal work hours and \$229.50 per hour for all off-hour inspections. University will provide itemized invoice for Contractor's records.
 2. Work unprepared for inspection: Re-inspections of the same work scheduled by Contractor, but not ready for inspection will be identified as a re-inspection.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

Note: Part 3 describes typical inspection requirements for each individual inspector's jurisdiction for non-OSHPD projects. Part 3 is provided as a reference source for Contractor's use and Scheduling, as applicable. Part 3 is not intended to be all-inclusive and Contractor shall verify actual inspection requirements needed for this project. See Item 3.12 for Testing, Inspection Observation for OSHPD.

3.01 FIRE DAMPERS (Title 24, Part 2, Chapter 43)

Note: Manufacturer's installation instructions shall be used for inspections and testing.

- A. 1 Hour: IOR test 100%. State Fire Marshal tests 100% or as needed.
- B. 2 Hour: IOR tests 100%. State Fire Marshal tests 100%.
- C. Smoke: IOR tests 100%. State Fire Marshal tests 100%.

3.02 FIRE SPRINKLERS (Title 24, Part 2, Volume 1, Chapter 9; NFPA Bulletin 13)

- A. Approved drawings shall be on job-site from start to completion of project.
- B. Underground pressure test @ 200 psi.
- C. State Fire Marshal to witness installation of underground lines.
- D. State Fire Marshal to witness underground flush prior to connection.

- E. Hydro-test above ground piping @ 200 psi for two (2) hours.
- F. Inspection of hangers, bracing, and seismic joint crossing(s).
- G. Flow alarm test, tamper switch test.
- H. Fire pump test.
- I. Certification by installer (Title 24, Part 9, Article 1006.3.4.2).
- J. Final inspection: signs in place, labeling, fire extinguishing system flow alarm test.

3.03 FIRE ALARM SYSTEM (Title 24; Part 9, Article 1006)

Note: Fire Sprinkler and Fire Alarm systems tests shall be performed in presence of State Fire Marshal.

- A. Approved drawings shall be on job-site from start to completion of project.
- B. Verify Emergency Power source.
- C. Activate all initiating devices.
- D. Certification by installer (Title 24, Part 9, Article 1006.3.4.2).
- E. Complete test of system per Title 24, Part 9, CFC, Article 1003.3.4.1).

3.04 MEANS OF EGRESS (Title 24, Part 2, Volume 1, Chapters 10)

- A. Exit sign/light locations and connected to two (2) sources of power.
- B. Normal Power.
- C. Emergency Electrical System, Life Safety Branch.
- D. Construction - floors, walls, ceilings, penetrations per listings.
- E. Electrical boxes - no back to back, 24 inches horizontal separation (Section 709).
- F. Electrical boxes - 100+ square inches to be wrapped/protected.
- G. Flame Spread, Fuel Contribution and Smoke Density for finishes (Chapter 8).

3.05 EMERGENCY LIGHTING

- A. Generator Test (Title 24, Part 3, Section 700-4; Section 701-5).
- B. Emergency lights - locations (Title 24, Part 2, Volume 1, Chapter 10, Section 1003.2.8.5).

3.06 KITCHEN HOOD FIRE SUPPRESSION SYSTEM (Title 24, Part 9, Article 10, Section 1005; Part 9, Section 10.513)

- A. Approved drawings shall be on job-site from start to completion of project.

B. State Fire Marshal to witness system test.

3.07 MECHANICAL CHECKLIST FOR CLOSE-OUT (Title 24, Part 4)

A. Mechanical Equipment Requirements

1. Access to Equipment (Section 305, 405, 606.5, 815, 2.2.8, 903, 910.8, 1106.3).
2. Labeling of Equipment (Section 307).
3. Identification of Equipment - Area or Space Served (Section 304.5).

B. Mechanical Testing

1. Air balance completed and reviewed by Mechanical Engineer-of-Record.
2. Hospitals (Chapter 3, Section 314.1, Table 2110-A).
3. Skilled Nursing (Chapter 3, Section 314.2) [test to include humidity controls in required areas - Section 2102(a)].
4. Hydronic balance completed and reviewed by Mechanical Engineer-of-Record.
5. Air and Hydronic reports forwarded to Mechanical Engineer of Record.
6. Fuel Gas line inspection (Part 4, Section 1406 and Appendix B, Chapter 16).
7. Atrium and/or Building Smoke Evacuation System (State Fire Marshal to witness).

C. Boilers

1. Boiler – Operating Adjustments and Instructions (Section 1022).
2. Boiler – Inspections and Tests (Section 1023).
3. Boiler – Clearances/Permits (Section 1005.0).

D. Ducts

1. Installation - Bracing (Part 4, Section 604.1.4)
2. Fire Damper test log from IOR (Part 4, Section 606.2).
3. Fire Damper test by State Fire Marshal (Part 4, Chapter 6, Section 606.2).
4. Smoke Damper and Detector test log from IOR (Including Duct Detector tests).
5. Smoke Damper and Detector by State Fire Marshal.

E. HVAC Unit Testing

1. Verify correct filter types and efficiencies.

2. Motor Rotation.
3. Condensate drain tests (Section 310).
4. Equipment shut down by smoke detectors (duct or space).

3.08 PLUMBING CHECKLIST FOR CLOSE-OUT (Title 24; Part 2, Chapter 29; Part 5)

A. Piping Systems (Title 24, Part 5)

1. Domestic Water Line Sterilization Test (Title 24, Part 2, Section 609.9; Title 22, Division 4, Chapter 16, Article 5).
2. Domestic Water System (hot, cold) Pressure test (Title 24, Part 5, 609.4).
3. Natural Gas Pressure Test (Title 24, part 5, Chapter 12, Section 1204).
4. Vent & Waste System Pressure test (Title 24, Part 5, 712.0).
5. Hydronic Water Pressure test (Title 24, Part 4 1201.2.8).

B. Water Heater Testing

1. Water Heater Temperature Test (Domestic/Patient) (105-120°F).
2. Water Heater Temperature Test (Kitchen) (180°F).
3. Water Heater Temperature Test (Laundry) (169°F).
4. Water Heater Temperature Alarm Test (Patient) (125°F).

C. Medical Gas System Testing (NFPA 99, Chapter 4) (Witnessed by SFM).

1. Pressure test - 150 psig - Oxygen, Medical Air & Nitrous Oxide (4-3.4.1.2).
2. Pressure test - 200 psig - Nitrogen (4-5.1.3.4).
3. 24-hour pressure test - 60 psig - Vacuum system (4-10).
4. 24-hour pressure test - 20% over operating pressure [A-4.3.4.1.2 (b)(e)].
5. Alarm test for system [4-3.4.1.3 (d)].
6. Area Valves, location, labeled, alarms tested (4-4.1 & 4-5.1.4).
7. Laboratory testing affidavits - welding/brazing (4-6.2.3.3).
8. Verified Medical Air Quality - Installation and 24 hour later.
9. Certification of system (Purity, Cross Connection, Alarms, Etc.) [4.5].
10. Certification of Bulk System [NFPA 50 (Oxygen) & CGA G-8.1 (Nitrous Oxide)].

11. Approved drawings and documents for submittal to University's Representative for permanent records).

3.09 ELECTRICAL CHECKLIST FOR CLOSE-OUT (Title 24, Part 3, and Part 1, Chapter 7, Section 7-141, 7-149)

A. Main Panel/Service

1. Identification and Labeling of Equipment (110-21, 110-22, 230-70).
2. Grounding test and Certification (250, 250-56).
3. Ground fault interrupt test adjustment and certification [230-95(c); 517-17(c)].
4. Emergency power transfer switch test (700-4).
5. Panel load balance.

B. Emergency Power and Standby Systems (Article 700 & 701) [Test Logs from IOR]

1. Emergency Generator testing and certification (701-5).
2. Identification and Labeling of equipment (110-21, 110-22, 517-22).
3. Lighting and Lighting Levels (517-22).
4. Receptacles (410L, 517-13, 517-18, 517-19).
5. Exiting signs and lights [517-32(b), 517-42(b)].
6. Nurse and Staff Call [517-33(a)].
7. Fire Alarm (760).

C. General Electrical Requirements

1. Working space/Headroom [Table 110-26(a); 110-33; 110-34].
2. Circuits and lights tested (410-45).
3. Receptacle polarity and grounding [200-10(b)].
4. Isolated ground monitor test [517-160(b)].
5. Motor load current adjustment.
6. Identification and Labeling of equipment (110-21; 110-22).
7. Identify circuits (Critical Care Areas) (517-19).

D. Miscellaneous Electrical Requirements

1. Test logs from Contractor and Inspector-of-Record.

2. Electrical Engineer-of-Record acceptance of system.
3. Owner In-Service training on Equipment.
4. Equipment Manuals and Instruction to Owner.
5. Warrantees and Equipment Certification.
6. As-Built/Record Drawings to Owner.

3.10 FIRE MARSHAL INSPECTION REQUIREMENTS

A. Framing Inspections

1. Structural members in fire-resistive construction.
2. Check fireproofing per approved design tested assembly description.

B. Fire-Rated Partition Locations

1. Check for stud and nailing/screwing spacing per approved design tested assembly description.
2. Check for fire blocking in combustible construction.
3. Check for rated door/window frame installation (manufacturer's installation instructions shall be available for review).
4. Check for electrical installation, for example; number and size of electrical boxes, panels, cabinets, etc.
5. Check hangers, seismic bracing for sprinkler piping installation, if applicable (this would be checked during overload pressure test inspection phase of sprinkler system).

C. Close-In Inspections

1. Check fire-blocking and draft stops in combustible construction.
2. Check gypsum board installation in accordance with approved design assembly description for rated assembly.
3. Check integrity of firewall construction where recessed cabinets, panels, excessive electrical/plumbing are installed.
4. Check fire damper installation (manufacturer's installation instructions shall be available for review). Fire Marshal will witness actuation of minimum 10% fire dampers installed and 100% in 2 hour or greater fire rated wall assemblies.
5. Check for through-penetrations and fire-stop systems in all walls or floor/ceiling assemblies.

D. Final Construction Inspections

1. Final project walk-through: Example, Emergency lighting will be tested to verify exit illumination of both interior and exterior, while generator (if applicable) is tested at same time.

3.11 OSHPD – Testing, Inspection and Observation (TIO)

- A. Refer to attach completed OSHPD TIO form signed by Architect/Engineer of Record for required testing.

END OF SECTION 01455

Project No. 9557320
East Wing 3RD Floor Bed Re-licensure
OSHPD #S202226-34-00

INSPECTION REQUEST

A/C #: 9559460 OSHPD #: S180582-34-00 UCDH IR #: Contractor IR #: Date:
Project Name: E7 EEG OFFICE RELOCATION Spec Section (s):

To: UC Davis Health (UCDH)	From:
Facilities Design & Construction – Inspection Trailer	
4430 V Street, Building 35	
Sacramento, CA 95817	
P: 916-734-5060	P:
F: 916-734-1375	Email:
Email: lfuka@ucdavis.edu & Project IOR	Attn.:

Drawing Ref.: Detail: Shop Drawing:

Project Schedule Activity ID No.: Date of Inspection: Time Requested:

Type of Inspection:

Location of Inspection (i.e., Floor, Column Line, etc.):

*Re-inspection Requested for Previous UCDH IR #:

All work Requested for Inspection has been reviewed for compliance with the contract documents by Contractor's Superintendent prior to notification of Inspection Request.

Signed: Date:

UCDH USE ONLY

Date Received: Time of Inspection:

Date of Inspection: Inspector: ☐ Inspection Report Attached

Inspector Arrival Time: Inspector Departure Time:

Comments:

☐ Approved ☐ Approved as Noted ☐ Not Approved ☐ Cancelled

Inspection Request Notes or Description of Items of Deficiency if needed below (Part 1, Chapter 7, Section 7-145, item 6)

Project Field Record of Construction Progress Summary of Work in Progress (Part 1, Chapter 7, Section 7-145, item 6)

Project Phase (Building Foundation, Structural, Wall Framing, Electrical Rough-In, Sprinkler Rough-In, etc.)

Project Phase Percentage Complete (% of the phase completed): Overall Project Percentage Complete:

NON-CONFORMING WORK NOTICE

A/C #: 9559460 OSHDP #: S180582-34-00 Notice #: Date:

To: _____ _____ _____ _____	From: UC Davis Medical Center (UCDMC) Facilities Design & Construction – Inspection Trailer 4430 V Street, Building 35-A Sacramento, CA 95817 P: 916-734-5060 F: 916-734-1375 Email: fdc.inspectors@ucdmc.ucdavis.edu
P: _____	
Email: _____	
Attn.: _____	

Spec Section Ref.: Paragraph: Drawing Ref.:

Detail: _____

In accordance with Article 12 of the General Conditions, the following defective condition(s) has/have become apparent:

Reported by: _____

CORRECTIVE ACTION SHOULD BE TAKEN AS SOON AS POSSIBLE AND COMMENCE NO LATER THAN TEN (10) CALENDAR DAYS AFTER THIS NOTICE. COORDINATE THE VERIFICATION OF THE CORRECTIVE ACTIONS WITH THE INSPECTOR OF RECORD. IF FURTHER INFORMATION IS NEEDED, ADVISE UNIVERSITY'S REPRESENTATIVE IN ACCORDANCE WITH THE GENERAL CONDITIONS.

Description of corrective action taken: _____

Accepted by: Date:

CC:

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1

This program is prepared and submitted for an OSHPD 1 project. OSHPD 1 projects include all construction and remodel projects for : general acute care hospitals, acute psychiatric hospitals, and general acute care hospitals providing only acute medical rehabilitation center services.

SECTION A		PROJECT INFORMATION	
Facility #:	Facility Name:		Project #:
10619	University of California Davis Medical Center		S202226-34-00
Street Address:	2315 Stockton Blvd		
City:	Sacramento	County:	Sacramento
Record Name (Scope of Project):		UCDMC M05416 East Wing 3rd Floor Bed Re-Licensure	
Abbreviations: CAC: California Administrative Code CBC: California Building Code CEC: California Electrical Code CMC: California Mechanical Code AAMA: American Architectural Manufacturers Association NFPA: National Fire Protection Association FM: FM Approval Standards DPOR: Design Professional of Record			
			Version: R03.7.2

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1

SECTION B		NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by OSHPD prior to proceeding with the related work.	
Facility #:	Facility Name:	Project #:	Sub #:
10619	University of California Davis Medical Center	S202226-34-00	0
Index #	REQUIRED (Select)	TESTS	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL
			COMPLIANCE VERIFICATION BY IOR (Initial/Date)
			OSHPD/FDD USE (Initial/Date)

STRUCTURAL TESTS

Concrete

B-C14	X	Post-installed anchors CBC 1910A.5 Installation verification test	IOR/Wallace-Kuhl & Associates OPAA-0031-16	DSE:

ELECTRICAL TESTS

B-E1	X	Ground fault protection CEC 230.95(C) & 517.17(D) Performance test	Electrical Contractor/ UCDH PO&M Dept.	FLSO:
B-E4	X	Grounding system in patient care spaces ~~2018 NFPA 99 6.3.3.1~~	Electrical Contractor/ UCDH PO&M Dept.	CO:
B-E6	X	Hospital grade receptacles 2018 NFPA 99 6.3.3.2.5	Electrical Contractor/ UCDH PO&M Dept.	CO:
B-E15	X	Nurse call system CEC 517.123	IOR/AON	CO:

MECHANICAL TESTS

B-ME9	X	Existing System Air Balance CMC 407.3 Pre-demolition Air Flow Test and Report	MESA 3, INC	CO:
B-ME10	X	Existing System Air Balance CMC 407.3 Post-demolition Air Flow Test and Report	MESA 3, INC	CO:
B-ME11	X	Ventilation system CMC 407.3.1 & Table 4-A Areas tested and balanced	MESA 3, INC	CO:

PLUMBING TESTS

B-P1	X	Disinfection of potable water systems CPC 609.9	Canon Water Tech, Inc.	CO:
B-P2	X	Medical gas and vacuum NFPA 99-2018 § 5.1.12 Gas and vacuum system performance testing	Plumbing Contractor/CYA	CO:
B-P3	X	Medical gas and vacuum NFPA 99-2018 § 5.1.12 Gas and vacuum system verification testing	Plumbing Contractor/CYA	CO:
B-P4	X	Existing sewers and drains CPC 102.4.1, 105.3 & 712.0 Tested for conformance with requirements for new work	Plumbing Contractor/ UCDH PO&M Dept.	CO:

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1

SECTION B			NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by OSHPD prior to proceeding with the related work.		
Facility #:		Facility Name:		Project #:	
10619		University of California Davis Medical Center		S202226-34-00	
Index #	REQUIRED (Select)	TESTS	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL	COMPLIANCE VERIFICATION BY IOR (Initial/Date)	OSHPD/FDD USE (Initial/Date)
B-P6	X	Plumbing, drainage, and venting systems CPC 105.3 & 712.0 Water or air tested prior to use, covering or concealment	Plumbing Contractor/ UCDH PO&M Dept.		CO:
B-P7	X	Building sewer CPC 105.3, 712.0 & 723.0 Water or air tested prior to use, covering or concealment	Plumbing Contractor/ UCDH PO&M Dept.		CO:
B-P14	X	Retesting CPC 105.3.2 Retest after corrections	Plumbing Contractor/ UCDH PO&M Dept.		CO:
B-P15	X	Shower receptors CPC 408.7.5	Plumbing Contractor/ UCDH PO&M Dept.		CO:
FIRE PROTECTION EQUIPMENT TESTS					
B-FP1	X	Fire Alarm CFC 901.5 & CFC 907.7 NFPA 72-2016 §14.4 Acceptance and Reacceptance Testing	IES, Inc.		FLSO:
B-FP2	X	Fire and smoke dampers CFC 901.5 & CFC 907.8 Acceptance testing	IOR/ Marquee Fire		FLSO:
B-FP5	X	Fire sprinkler CFC 901.5 & NFPA 13-2016 Chapter 25 Acceptance testing – Aboveground piping	IOR/ Marquee Fire		FLSO:

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SECTION C		NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by OSHPD prior to proceeding with the related work.			
Facility #:	Facility Name:	Project #:	Sub #:		
10619	University of California Davis Medical Center	S202226-34-00	0		
Index #	REQUIRED (Select)	ON-SITE SPECIAL INSPECTIONS	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL (IDENTIFY SPECIAL INSPECTOR)	COMPLIANCE VERIFICATION BY IOR (Initial/Date)	OSHPD/FDD USE (Initial/Date)
STRUCTURAL SPECIAL INSPECTIONS					
Nonstructural components, supports and attachments					
C-N6	X	Special Seismic Certification CBC 1705A.12.4 Special Seismic Certification label, anchorage and mounting	IOR		DSE:
FIRE PROTECTION SPECIAL INSPECTIONS					
C-FP3	X	Penetration firestops CBC 1705.17.1 & 1705A.17.1 Penetration firestop systems that are tested and listed	IFC Special Inspector Anothony Indrieri		FLSO:
C-FP6	X	Sprinkler system piping NFPA 13-2016 § 6.5.2 Welded pipe and fittings	Marquee Fire Protection, Inc.		FLSO:

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1

SECTION D			NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by OSHPD prior to proceeding with the related work.		
Facility #:	Facility Name:	Project #:	Sub #:		
10619	University of California Davis Medical Center	S202226-34-00	0		
Index #	REQUIRED (Select)	OFF-SITE SPECIAL INSPECTIONS	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL (IDENTIFY SPECIAL INSPECTOR)	COMPLIANCE VERIFICATION BY IOR (Initial/Date)	OSHPD/FDD USE (Initial/Date)
FIRE PROTECTION SPECIAL INSPECTIONS					
D-FP6	X	Sprinkler system piping NFPA 13-2016 § 6.5.2 Welded pipe and fittings	 Marquee Fire Protection, Inc.	 2	FLSO:

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1



SECTION F		CONSTRUCTION VERIFICATION										
Facility #:	Facility Name:		Project #:		Sub #:							
10619	University of California Davis Medical Center		S202226-34-00									
VERIFIED CONSTRUCTION INSPECTION AND OBSERVATION REPORTING												
REFERENCE NUMBER	PROJECT MILESTONE OR INTERVAL	VERIFIED COMPLIANCE REPORT REQUIRED AS INDICATED (Form OSH-FD-123) (See "PERSONAL KNOWLEDGE" as defined in California Administrative Code, Section 7-151)										FOR OSHPD USE ONLY
		GEOR	AOR	SEOR	MEOR	EEOR	CONT	IOR	SP INSP	TEST LAB	OSHPD FDD	
	Phase 1											
	Room Refresh for Patient Rooms & Patient Toilets 3101-3113, 3125, 3335-3339							X				
	1. Domestic Water Purification						X	X				
	2. Hot Water Supply to Hand Washing Fixtures						X	X				
	3. Medical Gases System verification for Cleanliness				X		X	X				
	4. HVAC, Filters, Air Changes Required, Air Balance, Temperature				X		X	X				
	5. Nurse Call System CEC 517.123					X	X	X				
	6. Fire Alarm, 100% Smoke Detector Function Verification						X	X				
	7. Provide Fire Sprinklers at Nurse Station						X	X	X			
	8. Fire Door Operation							X				
	9. Fire Damper Function							X				
	10. Electrical panels / Circuit Verification					X		X				
	11. Minimum Exit Lighting Requirements / Exit Signs					X		X				
	12. Overhead Communication					X		X				
	Ground Fault Protection CEC 230.95 & 517.17 (D) Performance Test						X	X				
	Grounding System in patient care spaces 2018 NFPA 99 6.3.3.1						X	X				
	Hospital Grade receptacles 2018 NFPA 99 6.3.3.2.5						X	X				
	Penetration firestops CBC 714.5.1 & 1705A.17.1 Penetration firestop systems that are tested & listed						X	X				
	Post-installed anchors CBC 1910A.5 Installation verification test						X	X	X			
	Ventilation system CMC 407.3.1 & Table 4-A Areas tested and balanced				X		X	X				
	Fire Rated Penetration (Rm 3116 Grout SOD per CBC 714.5.1)						X	X	X			
	Disinfection of potable water systems CPC 609.0						X	X				
	Certificate of Occupancy (New Buildings, Additions, Changes in Occupancy)		X	X	X	X	X	X	X			
	Phase 1 Milestone		X	X	X	X	X	X	X			

Testing, Inspection and Observation Program

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SECTION F		CONSTRUCTION VERIFICATION										
Facility #:	Facility Name:							Project #:		Sub #:		
10619	University of California Davis Medical Center							S202226-34-00		2		
VERIFIED CONSTRUCTION INSPECTION AND OBSERVATION REPORTING											FOR OSHPD USE ONLY	
REFERENCE NUMBER	PROJECT MILESTONE OR INTERVAL	VERIFIED COMPLIANCE REPORT REQUIRED AS INDICATED (Form OSH-FD-123) (See "PERSONAL KNOWLEDGE" as defined in California Administrative Code, Section 7-151)										
		GEOR	AOR	SEOR	MEOR	EEOR	CONT	IOR	SP INSP	TEST LAB		OSHPD FDD
	Phase 1 / ACD-02 Remodel of Rooms: 3101, 3103, 3105, 3107, 3109, 3111, 3113, 3117, 3125, 3132, 3135, 3136, 3137, 3139, 3140A, & 3142											
	Hospital Grade receptacles 2018 NFPA 99.6.3.3.2.5											
	Disinfection of Potable Water Systems CPC 609.9											
	Fire Alarm CFC 901.5 & CFC 907.7 NFPA 72-2016 § 14.1 Acceptance and Re-Acceptance Testing											
	Phase 1 / ACD-02 Milestone		X	X	X	X	X	X				
	Phase 2											
	Post-installed anchors CBC 1910A.5											
	Installation verification test											
	Ventilation system CMC 407.3.1 & Table 4-A											
	Areas tested and balanced											
	~~Ground Fault Protection CEC 230.95© & 517.17 (D)~~							X				
	~~Performance Test Grounding System in patient care spaces 2018 NFPA 99.6.3.3.1~~							X				
	Hospital Grade receptacles 2018 NFPA 99.6.3.3.2.5											
	Nurse Call System CEC 517.123											
	Disinfection of potable water systems CPC 609.9											
	Existing sewers and drains CPC 102.4.1, 105.3 & 712.0 Tested for conformance with req. for new work											
	Water supply system CPC 105.3 & 609.4 Pressure tested prior to covering or concealment											
	Plumbing, drainage, and venting system CPC 105.3 & 712.0 Water or air tested prior to use, covering or concealment											

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SECTION F		CONSTRUCTION VERIFICATION											
Facility #:	Facility Name:								Project #:			Sub #:	
10619	University of California Davis Medical Center								S202226-34-00				
VERIFIED CONSTRUCTION INSPECTION AND OBSERVATION REPORTING													
REFERENCE NUMBER	PROJECT MILESTONE OR INTERVAL	VERIFIED COMPLIANCE REPORT REQUIRED AS INDICATED (Form OSH-FD-123) (See "PERSONAL KNOWLEDGE" as defined in California Administrative Code, Section 7-151)										FOR OSHPD USE ONLY	
		GEOR	AOR	SEOR	MEOR	EEOR	CONT	IOR	SP INSP	TEST LAB	OSHPD FDD		
	Shower Receptors CPC 408.7.5												
	Penetration firestops CBC 1705A.17.1 Penetration firestop systems that are tested & listed												
	Fire Alarm CFC 901.5 & CFC 907.7 NFPA 72-2016 §14.4 Acceptance and Re-acceptance Testing												
	Phase 2 Milestone		X	X	X	X	X	X	X	X			
	Phase 3												
	Post-installed anchors CBC 1910A.5 Installation verification test												
	Ventilation system CMC 407.3.1 & Table 4-A ~~Areas tested and balanced~~												
	~~Ground Fault Protection CEC 230.95© & 517.17 (D) Performance Test~~								X				
	~~Grounding System in patient care spaces 2018 NFPA 99.6.3.3.1~~								X				
	~~Hospital Grade receptacles 2018 NFPA 99.6.3.3.2.5~~												
	Nurse Call System CEC 517.123												
	Disinfection of potable water systems CPC 609.9												
	Existing sewers and drains CPC 102.4.1, 105.3 & 712.0 Tested for conformance with req. for new work												
	Water supply system CPC 105.3 & 609.4 Pressure tested prior to covering or concealment												
	Plumbing, drainage, and venting system CPC 105.3 & 712.0 Water or air tested prior to use, covering or concealment												
	Penetration firestops CBC 1705A.17.1 Penetration firestop systems that are tested & listed												

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SECTION F		CONSTRUCTION VERIFICATION											
Facility #:	Facility Name:								Project #:		Sub #:		
10619	University of California Davis Medical Center								S202226-34-00				
VERIFIED CONSTRUCTION INSPECTION AND OBSERVATION REPORTING												FOR OSHPD USE ONLY	
REFERENCE NUMBER	PROJECT MILESTONE OR INTERVAL	VERIFIED COMPLIANCE REPORT REQUIRED AS INDICATED (Form OSH-FD-123) (See "PERSONAL KNOWLEDGE" as defined in California Administrative Code, Section 7-151)											
		GEOR	AOR	SEOR	MEOR	EEOR	CONT	IOR	SP INSP	TEST LAB			
	Fire Alarm CFC 901.5 & CFC 907.7 NFPA 72-2016 §14.4 Acceptance and Re-acceptance Testing												
	Phase 3 Milestone		X	X	X	X	X	X	X	X			
	Phase 4												
	Post-installed anchors CBC 1910A.5 Installation verification test												
	Ventilation system CMC 407.3.1 & Table 4-A Areas tested and balanced												
	Ground Fault Protection CEC 230.95© & 517.17 (D) Performance Test							X					
	Grounding System in patient care spaces 2018 NFPA 99.6.3.3.1 Hospital Grade receptacles							X					
	2018 NFPA 99.6.3.3.2.5 Nurse Call System CEC 517.123												
	Disinfection of potable water systems CPC 609.9												
	Existing sewers and drains CPC 102.4.1, 105.3 & 712.0 Tested for conformance with req. for new work												
	Water supply system CPC 105.3 & 609.4 Pressure tested prior to covering or concealment												
	Plumbing, drainage, and venting system CPC 105.3 & 712.0 Water or air tested prior to use, covering or concealment												
	Penetration firestops CBC 1705A.17.1 Penetration firestop systems that are tested & listed												
	Fire Alarm CFC 901.5 & CFC 907.7 NFPA 72-2016 §14.4 Acceptance and Re-acceptance Testing												
	Phase 4 Milestone		X	X	X	X	X	X	X	X			

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1

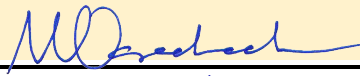
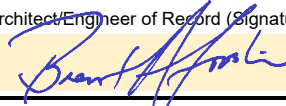
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SECTION F		CONSTRUCTION VERIFICATION											
Facility #:	Facility Name:							Project #:			Sub #:		
10619	University of California Davis Medical Center							S202226-34-00					
VERIFIED CONSTRUCTION INSPECTION AND OBSERVATION REPORTING													
REFERENCE NUMBER	PROJECT MILESTONE OR INTERVAL	VERIFIED COMPLIANCE REPORT REQUIRED AS INDICATED (Form OSH-FD-123) (See "PERSONAL KNOWLEDGE" as defined in California Administrative Code, Section 7-151)											FOR OSHPD USE ONLY
		GEOR	AOR	SEOR	MEOR	EEOR	CONT	IOR	SP INSP	TEST LAB		OSHPD FDD	
	Phase 5												
	Ventilation system CMC 407.3.1 & Table 4-A Areas tested and balanced												
	Penetration firestops CBC 1705A.17.1 Penetration firestop systems that are tested & listed												
	Nurse Call CEC 517.123 Acceptance Testing												
	Ground Fault Protection CEC 230.95© & 517.17 (D) Performance Test						X	X					
	Grounding System in patient care spaces 2018 NFPA 99 6.3.3.1						X	X					
	Hospital Grade receptacles 2018 NFPA 99 6.3.3.2.5												
	Fire Alarm CFC 901.5 & CFC 907.7 NFPA 72-2016 §14.4 Acceptance and Re-acceptance Testing												
	Fire and Smoke Dampers CFC 901.5 & CFC 907.8 Acceptance Testing												
	Smoke Control System CFC 901.5, CFC 909.18 & CFC 1705.18 and 1705A.8 Acceptance Testing												
	Fire Sprinkler CFC 901.5 & NFPA 13-2016 Chapter 25 Acceptance Testing - Aboveground Piping												
	Medical gas and vacuum NFPA 99-2018 5.1.12 Gas and vacuum system performance testing												
	Medical gas and vacuum NFPA 99-2018 5.1.12 Gas and vacuum system verification testing												
	Phase 5 Milestone Final		X	X	X	X	X	X	X	X			
	Substantial Compliance (Remodel, Renovations, Maintenance projects, Equipment Replacement)		X	X	X	X	X	X	X	X			
	Certificate of Occupancy (New Buildings, Additions, Changes in Occupancy)		X	X	X	X	X	X	X	X			
	Construction Final		X	X	X	X	X	X	X	X			
ABBREVIATIONS:		GEOR - Geotechnical Engineer of Record MEOR - Mechanical Engineer of Record SP. INSP - Special Inspector				AOR - Architect of Record EEOR - Electrical Engineer of Record IOR - Inspector of Record				SEOR - Structural Engineer of Record CONT O/B - Contractor or Owner/Builder Test Lab – Engr. For the approved agency			

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1

SECTION G		Inspector of Record (IOR) Responsibility	
Facility #:	Facility Name:	Project #:	Sub #:
10619	University of California Davis Medical Center	S202226-34-00	
This Section only required when more than one IOR will share responsibility on the project.			
INSPECTOR OF RECORD RESPONSIBILITIES. Per CAC 7-145: "The Inspector shall have personal knowledge, obtained by continuous inspection of all work of construction in all stages of its progress to ensure that the work is in accordance with the approved construction documents." This includes applicable Codes, Referenced Standards, Listings and Manufacturer's Installation Instructions applicable to the work shown in the approved construction documents. If a project has more than one inspector of record, the distribution of responsibilities for the work shall be clearly identified for each IOR per CAC 7-141(f). One IOR shall be designated as the 'lead' IOR per CAC 7-144(b). One IOR shall be assigned responsibility for "all other work" to make sure responsibility for the inspection of every part of the work is assigned.			
INSPECTOR OF RECORD CAC 7-141, 7-145 & 7-151	SCOPE OF INSPECTION		PERFORMED OFF-SITE
Roland "Chip" Smith	Lead IOR		
David Seames	Secondary IOR (when lead is on vacation)		

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1

SECTION H		PLAN REVIEW APPROVAL	
Facility #:	Facility Name:	Project #:	Sub #:
10619	University of California Davis Medical Center	S202226-34-00	
NOTE: When a structural engineer has been delegated responsibility for a portion of this project his or her signature is also required. For testing, Inspection and Observation Program Instructions visit: https://oshpd.ca.gov/construction-finance/resources/forms-applications-reminder-lists/#TIO			
Submitted By			
I have reviewed the approved construction documents for this project and all tests and special inspections required by Code are marked as "required" on this form.			
Greg Osecheck			12/9/2020
Architect/Engineer of Record (Print Name)		Architect/Engineer of Record (Signature)	Date
Brent Forslin			12/9/2020
Structural Engineer of Record (Print Name)		Structural Engineer of Record (Signature)	Date
FOR OSHPD USE			
OSHDP Plan Approval:			
 REVIEWED IN ACCORDANCE WITH THE REQUIREMENTS OF T24, CCR APPROVED Office of Statewide Health Planning & Development FACILITIES DEVELOPMENT DIVISION 12/17/2020, 1:59:23 PM S202226-34-00 Nicholas Galabov		☐ APPROVED ☐ APPROVED WITH COMMENTS ☐ DENIED	
Signature		Date	
Comments (If AC or D is checked the following comments shall be resolved by the designer prior to proceeding with the related construction):			

Testing, Inspection and Observation Program 2019 California Building Standards Code – OSHPD 1

SECTION I		BUILDING PERMIT APPROVAL	
Facility #:	Facility Name:	Project #:	Sub #:
10619	University of California Davis Medical Center	S202226-34-00	
NOTE: For testing, Inspection and Observation Program Instructions visit: www.oshpd.ca.gov			
This program has been prepared and submitted for an OSHPD 1 project. OSHPD 1 projects include all construction and remodel projects for general acute care hospitals and acute psychiatric hospitals.			
Samples of Test and Inspection Reports are: (NOT required for test performed by laboratories approved through OPAA Program)			
<i>Testing agency qualification for approval or approval of testing agencies shall be through OSHPDs OPAA program.</i>			
☐ OPAA PROGRAM (Provide copy of OPAA program approval for OPAA approved laboratories and testing agencies).			
☒ The qualifications, certifications, experience and independence of the approved agencies and individuals named on this form have been evaluated and accepted by the undersigned in accordance with CAC Section 7-141, 7-144 & 7-149; CBC 1703A.1.1 & 1704A.2.1; and ISO 17025 Section 4.1.4 as applicable. Approved agencies and individuals named for structural tests and special inspections have been evaluated and accepted by the structural engineer delegated responsibility for the design and administration of construction of the structural aspects (when such delegation has been made).			
☐ Samples of Test and Inspection reports to be provided following determination of the responsible firm(s) or individuals. Samples shall be submitted to and approved by the Office prior to proceeding with the work that requires test or special inspections.			
☐ Samples attached.			
☐ Not applicable. Project has no required test or special inspections.			
All test and special inspection reports shall be submitted to the IOR, hospital owner, architect in responsible charge, and the structural engineer by the testing agency per CAC 7-149(a) within seven (7) calendar days of the test or special inspection.			
Verified compliance reports shall be signed by the individual who performed the special inspection(s) as outlined in CAC 7-151 (c).			
All reports shall clearly state whether the tests or special inspections were performed in accordance with the OSHPD stamped approved documents and whether the results indicate compliance with those documents per CAC 7-149 (a). All IORs performing special inspections shall hold the appropriate certification and equipment and shall obtain approval from OSHPD prior to perform such work.			
Greg Osecheck	C33192		12/9/2020
Architect/Engineer of Record (Print Name)	Professional License #	Architect/Engineer of Record (Signature)	Date
FOR OSHPD USE			
OSHPD TI&O Program Approval:			
 Mickey Fong, RCO		☐ APPROVED ☒ APPROVED WITH COMMENTS ☐ DENIED	
Signature	Date		
Comments (If Approved with comments or Denied is checked the following comments shall be resolved by the designer prior to proceeding with the related construction):			
1) Plan approval is still in process as of this TIO review and conditional Approval with Comments on 12/13/2020. 2) Items noted as To Be Determined or changes shall be evaluated by the DPOR and approved by OSHPD Prior to commencement of work. 3) Correct OSHPD Project number on each page of this to S202226-34-00. County number listed as 31.			

Wallace-Kuhl & Associates
Special Inspectors and Test Technicians



OSHPD Project Name: UCDMC M054016 Main Hospital E3 PCS/FDC
Re-Licensure For Acute Care

OSHPD Project #: S202226-34-00

Inspector's Name	Date of Hire	Certification/License Type	Certification/Licensing Agency	Certification Number	Expiration	Print Date
Recv'd 4/10/2020						12/15/2020
Aaron Schmidt						
	6/24/2002	ACI Concrete Field Testing Tech Grade 1	ACI	58657	2/4/2022	
		Certified Welding Inspector	AWS	4120191	12/1/2022	
		Reinforced Concrete	ICC	5046554	3/21/2022	
		Spray-applied Fireproofing	ICC	5046554	3/21/2022	
		Structural Masonry	ICC	5046554	3/21/2022	
		Structural Steel & Bolting	ICC	5046554	3/21/2022	
		Structural Steel & Welding	ICC	5046554	3/21/2022	
		Structural Steel Welding	ICC	5046554	3/21/2022	
		Magnetic Particle Testing Level II	NDT In-House	N/A	8/24/2022	
		Ultrasonic Testing Level II	NDT In-House	N/A	5/4/2022	
Jadon Wenger						
	5/1/2017	ACI Concrete Field Testing Tech Grade 1	ACI	1398974	6/24/2022	
		Certified Bridge Welding Inspector	AWS	17040041	12/1/2022	
		Certified Welding Inspector	AWS	13120621	12/1/2022	
		Spray-applied Fireproofing	ICC	8884836	7/4/2021	
		Structural Bolting	AWS	16050121	12/1/2022	
Ray Moore						
	11/26/2018	ACI Concrete Field Testing Tech Grade 1	ACI	1060953	12/8/2023	
		Reinforced Concrete	ICC	5269137	5/10/2022	
		Structural Masonry	ICC	5269137	5/10/2022	
		Structural Steel & Bolting	ICC	5269137	5/10/2022	
Theodore Ball						
	5/7/2014	ACI Concrete Field Testing Tech Grade 1	ACI	1325727	4/18/2025	
		Prestressed Concrete	ICC	5246361	8/29/2021	
		Reinforced Concrete	ICC	5246361	8/29/2024	
		Spray-applied Fireproofing	ICC	5246361	8/29/2024	
		Structural Masonry	ICC	5246361	8/29/2024	
		Structural Steel & Bolting	ICC	5246361	8/29/2024	
		Structural Steel & Welding	ICC	5246361	8/29/2024	
		Class III Asbestos - Fireproofing Specific	HMS	N/A	N/A	

**SECTION 01510
TEMPORARY UTILITIES**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Temporary Power and Lighting.
- B. Temporary Heating, Cooling & Ventilation.
- C. Temporary Water.
- D. Temporary Fire Protection.
- E. Temporary Telephone.

1.02 RELATED SECTIONS

- A. Section 01110 – SUMMARY OF THE WORK
- B. Section 01350 – SPECIAL PROCEDURES: General requirements for temporary facilities and controls, to accommodate UCDMC occupancy and use of the areas and spaces adjacent to construction.
- C. Section 01561 – AIRBORNE CONTAMINANTS CONTROL
- D. Section 01740 – CLEANING
- E. Section 01770 – CLOSEOUT PROCEDURES

1.03 TEMPORARY UTILITIES

- A. Temporary Connections: Temporary power, water, sewer, gas and other utility services necessary for the Work may be made to existing building systems. Connections shall be subject to University's review and written approval. Coordinate with utility companies and University's Plant Operations & Maintenance Department for locations and methods of connections.
- B. Contractor shall provide and pay for installation, operation, maintenance, and removal of all utilities.

1.04 TEMPORARY POWER AND LIGHTING

A. Service Requirements:

- 1. Temporary Electrical Service: Contractor shall provide and pay for installation, operation, maintenance, and removal of temporary electrical service, lighting devices and restoration of existing and permanent equipment in accordance with applicable provisions of the Electrical Safety Orders of the State of California. Use of University's electrical power and lighting system is prohibited without University's written approval and will be considered only when an alternate electrical power source is unavailable.

- a. Install initial services at time of site mobilization.
 - b. Modify and extend systems as Work requires.
 - c. Maintain electrical system to provide continuous service, including prompt restoration of interruptions to University systems when temporary service is connected.
 - d. Restore existing and permanent lighting used during construction to original condition. Replace defective fixtures, bulbs, and other component parts.
 - e. Clean existing and permanent lighting fixtures used during construction per Section 01740 – CLEANING.
2. Distribution: Contractor shall provide distribution network for temporary electrical power.
 3. Power Source: Arrange for service with University's Plant Operations and Maintenance Department, or local utility company.
 4. Conformance: All temporary wiring and electrical facilities shall be in accordance with applicable provisions of Electrical Safety Orders of the State of California.
 5. Temporary Lighting: Construction lighting shall be supplied and maintained by Contractor at Contractor's expense. Sufficient lighting levels shall be provided to allow construction to be properly and safely performed. Contractor shall give special attention to adequate lighting for stairs, ladders, floor openings, basements and similar spaces. Promptly replace burnt out, worn or defective parts.
 6. Lighting fixtures: Locate fixtures in areas of Work: One (1) lamped fixture in rooms, except closets and utility chases; one (1) lamped fixture for every 750 square feet in large areas.
 7. Security Lighting: Contractor shall provide security lighting during hours of low visibility.
- B. Distribution requirements:
1. Weatherproof distribution boxes with one (1) - 240 volt, three (3) phase power outlet and four (4) - 120 volt outlets consisting of 100 amperes fused switches with equipment ground, spaced so a 100-foot extension cord will reach all areas of building.
 2. Wiring, connections and protection for temporary lighting.
 3. Wiring connections and protection for temporary and permanent equipment, for environmental control, for temporary use of electricity operated equipment, and for testing.

- C. Use of University System: If alternate electrical power and lighting sources are unavailable, University may permit Contractor to use existing, in-place electrical system. University does not guarantee availability of electrical power or adequate lighting levels through use of existing system. If power and lighting is insufficient or not available Contractor shall provide secondary source (i.e. generator) as approved by University.
1. It is expressly understood and agreed by Contractor that University existing power and lighting system's primary obligation is servicing patient care. The University system is not designed for purposes of construction activities.
 2. Contractor should expect power and lighting interruptions during course of Work. Contractor will be required to cease use of University electrical-power and lighting systems, as required by the needs of University.
 3. When use of University electrical system is approved in writing, Contractor is required to adhere to University's electrical lockout procedures. See Division 16 – Electrical.
 - a. Provide and maintain warning labels on energized equipment.
 - b. Replace plates, electrical devices or similar existing items or components damaged as a result of temporary usage.

1.05 TEMPORARY HEATING, COOLING AND VENTILATING

A. Service Requirements:

1. Contractor shall provide temporary heat as necessary for proper installation of all work and to protect all work and materials against injury from dampness and cold and to dry out building. Fuel, equipment and method shall be approved in writing by University's Representative.
2. Install initial services at time of site mobilization. Modify and extend systems as Work requires.
3. Maintain systems to provide continuous service, including prompt restoration of interruptions to University systems when temporary service is connected.
4. Use of permanent heating system is preferred to any other system for maintaining temperature of building during installation of finish materials, but such use will not be permitted before clean-up after plastering and/or drywall work has been completed. Contractor shall make every effort to complete permanent heating system in time for such use. Permanent fans shall not be used before filters are installed. Filters shall be cleaned and serviced by Contractor just prior to final acceptance.
 - a. Vent portable units to building exterior, complete with automatic controls. Direct-fired units are not allowed. Locate units and outlets to provide uniform distribution of heating, cooling and ventilating.
 - b. Operate and maintain existing equipment being used; clean or replace filters and install filters in duct extensions as necessary to maintain occupied areas, work areas and finished areas, in specified condition.

- c. Prior to operation of permanent equipment, verify controls and safety devices are complete, equipment has been tested, and inspection made and approved for operation.
 - d. Remove temporary materials and equipment when permanent system is operational. Restore existing and permanent systems used for temporary purposes to original condition.
 - e. Install temporary filters in air handling units and ducts, replace as necessary to prevent dust in equipment and ducts, to avoid contaminants in Work or finished areas. After completion, replace temporary filters with new, clean, reusable filters.
 - 5. Maintain temperature, humidity, and ventilation in enclosed areas to provide ambient conditions for storage, preparation and Work; to cure installed materials, to prevent condensation, to dry floor surfaces and to prevent accumulations of dust, fumes and gases.
 - 6. During non-working hours maintain temperature in enclosed areas occupied solely by Contractor at a minimum of 50°F., or higher as specified in individual Sections and by individual product suppliers and manufacturers. Areas occupied in whole or in part by University are to be maintained at normal temperatures.
 - 7. Provide high efficiency particulate air (HEPA) filters as specified in SECTION 01561 – AIRBORNE CONTAMINANTS CONTROL, negative pressure ventilation, or special control of existing system as determined by University's Representative.
- B. Utility Sources:
- 1. Electrical: As specified above in Item 1.04.
 - 2. Existing mechanical systems may be used for temporary purposes. Coordinate use with University for conditions to be maintained in adjacent University occupied areas.
 - 3. Contractor shall provide and pay for all installation, operation, maintenance and removal of equipment in accordance with applicable provisions of the Electrical Safety Orders of the State of California.

1.06 TEMPORARY WATER

- A. Service Requirements:
- 1. Maintain systems to provide continuous service, including prompt restoration of interruptions to University's systems when temporary service is connected.
 - 2. Water service, if necessary for construction, can be made available at no expense to the Contractor provided the water is not wasted. Contractor shall be responsible for distribution of water to points of use.
 - 3. Certified reduced pressure type back-flow prevention device as submitted to and approved by University shall be installed before water is obtained from a University campus fire hydrant or interior building connection.

- B. Plumbing: Maintain system to provide continuous service with adequate pressure to outlets, including University system when temporary service is connected. See also Division 1 Approvals and ILSM requirements.
1. Size piping to supply construction needs, temporary fire protection, and for University's needs when existing service is connected.
 2. Disinfect piping used for drinking water. See Division 15 for requirements.
 3. Source: University existing service, connect at locations as directed by University.
 4. Provide valved outlets to control water pressure adequately for hoses.
 5. Fire hydrants used for water supply for construction – Contractor must use only $\frac{7}{8}$ " square hydrant wrench on square operating nut and must use only pentagon wrench on pentagon operating nut. This is to prevent damage to the hydrant operating nut. Any damage caused by the use of an improper wrench or other misuse of the hydrant must be repaired at contractor expense. Contractor must inspect hydrant prior to use and make the University aware of any pre-existing damage.
- C. Use of Existing System: Existing system may be used for temporary water. Monitor usage to prevent interference with University's normal operational requirements.
- D. Use of Permanent System: Contractor shall obtain written agreement from University establishing start of warranty period and conditions of use.
- E. Contractor shall pay for installation, operation maintenance and removal of system and restoration of existing and permanent equipment. University will pay costs of water consumed for normal construction operations. Contractor shall take measures to conserve usage.

1.07 TEMPORARY FIRE PROTECTION

- A. Requirements:
1. Maintain systems to provide continuous service, including prompt restoration of interruptions to University systems when temporary service is connected.
 2. Provide and maintain fire protection equipment including extinguishers, fire hoses and other equipment as necessary for proper fire protection during course of the Work.
 3. Use fire protection equipment only for fighting fires.
 4. Locate fire extinguishers in field offices, storage sheds, tool houses, other temporary buildings and throughout construction site. In area under construction, provide at least one (1) fire extinguisher for each 5,000 square feet of building floor area. Locate fire extinguishers so that a person never has to walk more than seventy-five (75) feet to obtain one.

5. Assign qualified person with authority to maintain fire protection equipment, institute fire prevention measures, and direct prompt removal of combustible and waste material. Submit ILSM requirements per Specification SECTION 01350 – SPECIAL PROCEDURES.

1.08 TEMPORARY TELEPHONE

A. Service Requirements:

1. Maintain systems to provide continuous service, including prompt restoration of interruptions to University systems when temporary service is connected.
2. Contractor shall select from the following options:
 - a. University shall provide conduit, cabling and dial tone to Contractor's location(s). Contractor shall pay University for cable, conduit installation and later removal of same and also pay University a monthly fee for use of University telephone system.
 - b. University shall provide conduit and cabling to Contractor's location(s). Contractor shall receive dial tone from local utility. Contractor shall pay University for cabling, conduit installation, maintenance of same and later removal of same. Contractor shall pay local utility for monthly telephone service.
3. Contractor shall select number of lines, instruments and other features.
4. Contractor shall prepare and submit to University, "UNIVERSITY TELECOMMUNICATION TELEPHONE SERVICE FOR OUTSIDE CONTRACTORS" form. Refer to attached form at end of this section.

B. Use of Existing System: Existing University telephone system shall not be used for temporary telephone service.

C. Contractor Phone:

1. Contractor shall have telephone emergency number or other facility available at Contractor's business office for duration of contract where contractor and superintendent may be contacted within twenty-four (24) hours. Provide emergency numbers to University.

D. Telephones:

1. Contractor shall use, and only permit to be used, FCC approved communication devices on frequencies approved by FCC and University.
2. Contractor shall not use, or permit to be used, communication devices which interfere with existing University communication systems, including, but not limited to:
 - a. Life Flight or CHP helicopters.
 - b. Emergency Service vehicle communications.

- c. Plant Operations & Maintenance communication devices.
- d. Microwave transmission stations.
- e. UCDMC closed-circuit television or radio signals.
- f. Cellular or other mobile phone systems in main hospital.
- g. UCDMC voice or digital paging systems.

PART II - PRODUCTS

2.01 MATERIALS

- A. May be new or used, adequate to the purpose.
- B. Devices and Equipment: Standard devices, meeting UL requirements.
- C. Telephones: may be product of local service company or specialty devices compatible with service company requirements.

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01510

UC Davis Health System
Telephone Service for Construction Trailers/Work Sites

UCDMC Project Managers

When construction bids are awarded, please include this form in the project packet. Contact Jim Fralick at 916-734-3399 or Amy Yee at 916-734-8000 in Telecommunications to verify the correct termination point for each project.

CONTRACTORS

To order telephone service for your construction site at UC Davis Medical Center, please use the following instructions – see page 2 for additional information:

- Call AT&T at “800-750-2355” to order your telephone lines. You will need to give them the following information:
 - a. Bring service to: 2315 Stockton Blvd, Sacramento, CA – 1.1 MPOE, Admin Bldg (or other location as designated)
 - b. Site contact person: Amy Yee, 916-734-8000
 - c. Request the installer to call Amy Yee with binding post information
- AT&T will provide the new assigned telephone numbers, an order number and the installation date.
- Enter the information onto the form below.
- Fax the completed form to:

UC Davis Medical Center, Telecommunications
Fax # 916-456-8331
Attention: Amy Yee – 916-734-8000
amyjee@ucdavis.edu

.....

Date: _____ Project Name: _____

Company Name: _____

Contact Name: _____

Phone or Cellular #: _____ Email address: _____

Location of construction site: _____

UCDHS Project Manager: _____ Phone #: _____

AT&T Order Information

Telephone number assignments: _____

AT&T Order #: _____ Pacific Bell due date: _____

Note: This form is to be used for ALL telephone services ordered for this project, including Fax Lines, Modem/DSL Lines and Payphones.

The following are typical telephone system safety practices required by the subs to get site-accessed phone, T1, DSL and fax services:

1. Cabling from the University splice point to the trailer needs to be "pic" (gel filled) outside plant cable (Superior Essex-Sealpic-24 ga, 6, 12 pair, Graybar cut to length) protection against the elements and accidental faults. Requires 8-foot minimum pigtail at the splice box.
2. DMARC at trailer needs to have a primary protection module (Sec 800-30&41 CEC-2002, found at Graybar) with 2, 4, 6, 8, pair protection to receive the cable from the splice.
3. 1-8 foot copper coated ground rod placed at the trailer and wired by an electrician to the trailer power ground (building) and Telephone primary protector module.

UC Davis Medical Center contact for additional information: Jim Fralick – 916-734-3399

**SECTION 01520
CONSTRUCTION FACILITIES**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Field Offices and Sheds
- B. Temporary Facilities
- C. Temporary Sanitary Facilities

1.02 RELATED SECTIONS

- A. Section 01110 – SUMMARY OF THE WORK
- B. Section 01350 – SPECIAL PROCEDURES: General requirements for temporary facilities and temporary controls to accommodate University continued occupancy, and use of the areas and spaces adjacent to construction.
- C. Section 01740 – CLEANING
- D. Section 01770 – CLOSEOUT PROCEDURES

1.03 FIELD OFFICES AND SHEDS

- A. Field Office: Contractor shall provide a job office that will conform to the following minimum requirements:
 - 1. Suitable space for drawings, specifications, samples and other project records.
 - 2. Conference space for eight (8) persons, including layout tables.
 - 3. Heating and cooling to maintain a reasonable working environment.
 - 4. Telephone service as specified in Section 01510 – TEMPORARY UTILITIES
 - 5. Furnishings required: Conference table and chairs; racks and files for Contract Documents, submittals, and project record documents. Other furnishings are at Contractor's option.
- B. Installation: Install office spaces for occupancy fifteen (15) calendar days after date of University/Contractor agreement.
- C. Preparation: Fill and grade sites for temporary structures to provide drainage away from buildings.

- D. Contract Documents: Complete set of Contract Drawings and Contract Specifications shall be kept continuously at the site. Copies of all Change Orders, letters, Shop Drawings, etc., shall be kept on the job-site at all times and shall be available for inspector's use.
- E. Contact numbers: Contractor shall provide telephone numbers where Contractor may be reached at all times during normal working hours and also after normal working hours, if emergency problems develop that require Contractor's assistance.
- F. Storage Sheds and Containers for Materials, Tools and Equipment: If requested, University will provide space outside construction site where Contractor may provide and locate weather-tight sheds or containers for storage of construction materials, tools and equipment. Contractor shall be solely responsible for security of such sheds and containers. Size storage requirements to allow access, orderly provision of maintenance and inspection of products.
- G. Cleaning: Weekly janitorial services for offices; periodic cleaning and maintenance for office and storage areas. Contractor shall keep construction loading and parking areas clear of construction debris, especially debris that may cause slipping or tripping hazard that may injure vehicle tires, that may stain surfaces, and that may be tracked into existing buildings. Maintain approach walks free of mud and water.
- H. Removal: Upon completion of the work, and before the final payment, Contractor shall remove all temporary work and facilities and return site to condition required by the General Conditions of the Contract and at no change to the Contract Sum or the Contract Time.

1.04 TEMPORARY FACILITIES

- A. Contractor shall provide and maintain the following temporary facilities as required for execution of the Work:
 - 1. Scaffolding, staging, runways and similar equipment.
 - 2. Hoists or construction elevators, complete with operators, power and signals required.
 - 3. Temporary rigging, rubbish chutes, barricades around openings, ladders between floors, and similar equipment.
 - 4. Barricades, fencing, lights and similar safety precautions.
- B. Maintenance: Use all means necessary to maintain temporary construction facilities and controls in proper and safe condition throughout progress of the Work.
- C. Replacement: In event of loss or damage, promptly restore temporary construction facilities and controls by repair or replacement at no change to the Contract Sum or the Contract Time.
- D. Conformance: All materials and equipment required to safely accomplish work under this Section shall be in conformance with requirements of CAL OSHA and other State and Federal Codes and regulations where applicable.
- E. Codes: All temporary work and facilities shall conform to the above requirements that pertain to operation, safety and fire hazard.

- F. Construction Site Security: Temporary barriers, doors and gates shall be keyed to University's master lock system. Security hardware to be provided by Contractor. Keying to University master lock system will be provided by University.

1.05 TEMPORARY SANITARY FACILITIES

- A. Use of existing facilities: Designated toilet facilities may be used by Contractor.
1. Assigned facilities: Location of assigned toilet facilities and maintenance of same are responsibility of University. Contractor shall not have exclusive use to these facilities and shall abide by health and safety criteria regarding their use and sanitary upkeep.
 2. Unassigned facilities: Unassigned toilet facilities shall not be used without written authorization of University's Representative.
 3. Contractor may use existing toilet facilities that are within the limits of the Work.
- B. Contractor shall pay service charges for connection and use of sewage utilities.
- C. Portable units: Enclosed, portable, self-contained units or temporary water closets and urinals, secluded from public view may be used. Self-contained units shall be approved by University's Representative prior to use.
1. Contractor shall pay costs of installation, maintenance and removal of temporary sanitary facilities.
 2. Provide facilities at time of site mobilization.
 3. Modify and extend services as work progress requires.
 4. When utility services are available, provide water, sewer service, and temporary water closets; remove portable facilities. Remove temporary fixtures when permanent facilities are operational.
 5. Clean areas of facilities daily, maintain in sanitary condition. Disinfect fixtures, repair or replace damaged fixtures, accessories and surfaces.
 6. Provide toilet paper, paper towels, and soap in suitable dispensers.
 7. Restore existing and permanent areas and facilities used to original condition.

PART II - PRODUCTS

2.01 MATERIALS

- A. Serviceable, new or used, adequate for required purpose.

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01520

**SECTION 01550
VEHICULAR ACCESS AND PARKING**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Construction Parking and Access Roads
- B. Traffic Regulation
- C. Project Informational Signs

1.02 RELATED SECTIONS

- A. Section 01110 – SUMMARY OF THE WORK
- B. Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- C. Section 01350 – SPECIAL PROCEDURES: General requirements for temporary facilities and temporary controls to accommodate University's continued occupancy and use of the areas and spaces adjacent to construction.
- D. Section 01740 – CLEANING
- E. Section 01770 – CLOSEOUT PROCEDURES: Project Closeout.

1.03 PARKING AREAS AND ACCESS ROADS

- A. Access Roads: Existing roads shall be used for construction access within limits defined herein. Temporary construction access roads shall not be permitted.
- B. Parking: Parking is controlled and limited by University.
 - 1. Parking of personal vehicles belonging to Contractor employees may be arranged with University's Parking Services, at 916-734-2687. Parking will be allowed in employee permit areas, at the current permit rates depending on space availability. All permits must be purchased on cash basis.
 - 2. Delivery of materials may be made to the job-site as required. Contractor shall coordinate with University's Representative.
 - 3. Dumpsters shall be located in approved location as arranged by University's Representative.
- C. Existing Pavements and Parking Areas: Designated existing on-site streets and driveways may be used for construction traffic. Vehicles with metal tracks will not be allowed.
 - 1. Designated areas of existing parking facilities may be used by construction personnel. Do not allow heavy vehicles or construction equipment in parking areas.

2. Maintain traffic and parking areas in a sound condition, free of excavating material, construction equipment, products, mud, snow and ice.
3. Maintain existing and permanent paved areas used for construction. Repair existing facilities damaged by usage to original condition: promptly repair breaks, potholes, low areas, standing water and other deficiencies, to maintain paving and drainage in original or specified condition.
4. Remove temporary materials and construction when permanent paving is usable.

1.04 TRAFFIC REGULATION

- A. Schedule of Access Closing: Contractor shall adopt all practical means to minimize interference to traffic. Access to other facilities in the area shall be maintained at all times. Contractor shall provide schedule of planned closing of any street for approval by University and shall give minimum of fourteen (14) calendar days notice before closing any street or access.
- B. Use of Fire Lanes: Contractor shall notify University of all major pickups and deliveries that require use of controlled access fire lanes. Keys to gates or other barriers will be provided, as needed, to allow use of fire lanes. Vehicles parked in fire lanes for delivery of materials shall be continuously manned for immediate removal if required by the University.
- C. All major pick-up and delivery operations shall occur in total before or after normal working hours.
 1. Drawings may indicate haul routes designated by University for use of construction traffic. Confine construction traffic to haul routes.
 2. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.
- D. Post-mounted and wall-mounted traffic control and informational signs as specified herein.
 1. Traffic Control Signs, Cones, Drums, Flares, Lights and Flag Control equipment: All as approved by California MUTCD requirements.
 2. Contractor shall furnish at all barricades: Lights and flag control required to control traffic, and shall also provide and maintain suitable temporary barricades, fences, directional signs, or other structures as required for protection of the public; and maintain from the beginning of twilight throughout the whole of every night on or near the obstructions, sufficient lights and barricades to protect the public and/or the Work.
- E. Construction Vehicle Parking: Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and University's operations. Prevent parking on or adjacent to roads or in non-designated areas.
- F. Flag Control: Provide properly trained and equipped flagmen to regulate vehicular traffic when construction operations or traffic encroach on public traffic ways.
 1. Provide properly trained and equipped personnel to regulate pedestrian traffic at all interior locations where construction traffic interfaces with University traffic.

2. Flag control personnel shall wear appropriate identifying clothing such as bright colored vests, clearly visible and identifiable as having responsibility for traffic control.
- G. Lights: Use lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- H. Traffic Signs and Signals: At approaches to site and on site, install traffic signs and signals at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
1. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
 2. Relocate traffic signs and signals as Work progresses, to maintain effective traffic control.
 3. Remove equipment and devices when no longer required. Repair damage caused by installation.

1.05 PROJECT INFORMATIONAL SIGNS **[NOT USED]**

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01550

SECTION 01560
TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Barriers and Enclosures
- B. Protected Walkways and Weather Closures
- C. Tree and Plant Protection
- D. Temporary Controls

1.02 RELATED SECTIONS

- A. Section 01110 – SUMMARY OF THE WORK
- B. Section 01350 – SPECIAL PROCEDURES
- C. Section 01561 – AIRBORNE CONTAMINANTS CONTROL
- D. Section 01740 – CLEANING

1.03 BARRIERS AND ENCLOSURES

- A. Barricades: Provide to prevent public entry, to protect existing trees and plants, and to protect existing facilities and adjacent properties from damage during construction period. Relocate and extend as construction progress requires per California MUTCD requirements.
- B. Partitions and Ceiling Enclosures:
 - 1. Fire Enclosures-Rated-Corridors and Rated Assemblies: Provide non-combustible dust-proof barrier framed with metal studs spaced 24" o/c maximum and covered on both sides with 5/8" thick Type-X rated gypsum wallboard taped, braced so to be self-supporting without fastening to existing finishes.
 - a. Provide gaskets of closed cell neoprene, or strips of fiberglass insulation between barriers and existing finish.
 - b. Finish exposed surfaces with two (2) coats of paint (color as selected by University), maintain in neat, orderly appearance and paint barrier on public side. Temporary emergency exit and or directional signage indicating Emergency Exits will be furnished and installed by Contractor.
 - c. Provide temporary doors in corridors with twenty (20) minute fire-rated assemblies and locksets to limit use.
 - d. Use of access doors and routes by workmen to be approved by University's Representative.

2. Fire Retardant Enclosures - Non-Rated Assemblies: Provide non-combustible dust-proof barriers framed with metal studs and covered on public side with Fire Retardant plastic laminate sheathing material. Flame spread 10 - smoke development 45 - fuel contribution undeterminable, as manufactured by Reef Industries, Inc., P.O. Box 33248, Houston, TX 77033 or equal.
 - a. Joints shall be taped and sealed over framing studs.
 - b. Bracing shall be self-supporting without fastening to existing finishes.
 - c. Provide gaskets of closed cell neoprene, or strips of fiberglass insulation between barriers and existing finishes.
 - d. Provide non-staining taped seal to surrounding materials to insure seal.
 - e. Non-Rated Assemblies for Dust Control: Use ½" Type-X or equal gypsum wallboard applied on occupancy side on framing member. Joints over studs shall be taped and sealed. Other detail similar to 1.03-B.2 above.
- C. Removal: Remove temporary materials, equipment and construction at completion; repair damage caused by installation or use of barricades and enclosures. Restore existing facilities used during construction to specified, or to original condition.

1.04 DIESEL VEHICLE/EQUIPMENT IDLING PROCEDURES

- A. When drivers of diesel powered on-road vehicles arrive at loading or unloading areas to drop-off or pick-up passengers, supplies, equipment, materials, etc., they shall turn off their vehicle's engine as soon as possible but no later than five minutes after arrival.
- B. Operators of off-road diesel powered equipment shall turn off their engines when the equipment is not performing its primary function, but no later than five minutes after the equipment has come to a stop.
- C. Idling for "warm-up" prior to diesel vehicle or equipment operations on UCDMC property shall be limited to a maximum of five minutes.
- D. At end of work shift, or for the purpose of servicing, all diesel equipment shall be parked on site at furthest location away from Hospital air intake systems.
- E. All diesel powered equipment shall be maintained in good operating condition. University representative will direct Contractor to remove any equipment producing high amount of diesel fumes resulting from diesel equipment being old or in poor operating condition.

1.05 PROTECTED WALKWAYS AND WEATHER CLOSURES

- A. Cover walkways to provide access to existing facilities for use by public and University personnel.
- B. Provide temporary roofing and weather-tight insulated closures of openings in exterior wall surfaces, to maintain specified working conditions, to protect products and finished work from inclement weather.
- C. Critical access and protected walkways shall comply with the CBC and CFC.

1.06 TREE AND PLANT PROTECTION

- A. Tree Protection: All trees not marked for removal shall be protected against damage from construction operations. Where necessary, in the opinion of University's Representative, trees surrounding building footprint or in close proximity to construction operation shall be protected with barricades. No trees shall be cut or felled without approval of University's Representative. Trees cut and/or removed without explicit instruction shall be replaced by Contractor at no cost to University.
- B. Cutting and Pruning: Cutting and pruning of trees to accommodate construction shall be done only with approval and direction by University's Representative. Soil within the spread of tree branches (within drip line) shall not be disturbed except as directed by excavation or trenching drawings. Advance notice shall be given University if tree roots of 3" diameter or greater must be cut.
- C. Drip line Protection: Cars, trucks, or equipment shall NOT be parked or set within the drip line of any tree; nor shall there be any stockpiling or temporary building erected within the drip line.

1.07 TEMPORARY CONTROLS

- A. Dust Control: Contractor shall take appropriate steps throughout project to prohibit airborne dust due to work under this contract. Execute work by methods to minimize raising dust from construction operations. Water shall be applied wherever practical to settle and hold dust to minimum, particularly during demolition and moving of materials. No chemical dust prohibitors shall be used without written approval by University's Representative.
- B. Noise Control: Control noise as directed by University's Representative.
- C. Pollution Control: Use of noxious or toxic materials for all applications in alterations or work in buildings occupied by University personnel shall be done after proper notification and approval by University, this includes work performed on weekends or other unoccupied times.
 - 1. Provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.
- D. Waste Control: All waste materials resulting from process of clearing and construction shall be disposed of as follows:
 - 1. General Refuse: All refuse and debris, combustible and incombustible, resulting from construction process, shall be removed from University property as described in the General Conditions of the Contract. Contractor shall not use any refuse container belonging to University.
 - 2. Hazardous Refuse: Solvents, oils and any other hazardous material shall be disposed of in containers and removed from site. At completion of work, any contaminated soil shall be removed and replaced with good soil by Contractor at no expense to University. Coordinate disposal with UCDMC EH&S department.
 - 3. Building materials containing asbestos that are part of the project shall not be disturbed or removed by the contractor during the construction of temporary barriers, enclosures and controls. The contractor shall request from the

University's Representative materials that have been identified on the project to contain asbestos so that these materials are not disturbed. The contractor shall refer to Section 01350 Special Procedures, 1.05 Hazardous Materials Procedures regarding materials impacted by construction of temporary barriers, enclosures and controls.

4. All material and equipment removed as part of the Project is property of University, unless specifically designated otherwise; such material and equipment shall be delivered to a location at Medical Center, as directed by University, to be selectively sorted by University; remaining debris shall be disposed of by Contractor at no expense to University.
- E. Drainage Control: All portions of Work shall be kept free of standing water at all times during construction. Where required, temporary drainage ditches, berms, or pumping systems shall be constructed to divert drainage water from construction site, and resultant water shall be carried to nearest natural water course and disposed of without erosion to surrounding area. Care shall be taken to prevent silting of existing sinkholes and water-courses. Silt deposited as a result of the Work shall be removed and disposed of by Contractor at no cost to University.
1. Rough grade site to prevent standing water and to direct surface drainage away from excavations, trenches, adjoining properties and public right-of-ways.
 2. Maintain excavations and trenches free of water. Provide and operate pumping equipment of a capacity to control water flow.
 3. Provide de-watering system and pumping to maintain excavations dry and free of water inflow on a twenty-four (24) hour basis.
 4. Provide piping to handle pumping outflow to discharge in manner to avoid erosion or deposit of silt. Provide settling basins to avoid silting; install erosion control at out-falls of system.
 5. Remove equipment and installation when no longer needed.
- F. Sediment and Erosion Control: Contractor shall furnish, install and maintain means and methods to reduce excessive erosion, minimize sedimentation discharge, and prevent construction materials discharge from causing off-site and on-site contamination. Contractor shall coordinate with University.
1. Contractor shall pay for and maintain required permits.
 2. Contractor shall furnish:
 - a. National Pollutant Discharge Elimination (NPDE) permit.
 - b. Contractor shall file Notice of Intent to California State Water Resources Control Board (SWRCB) stating date construction will begin. Provide copy to University.
 - c. Contractor shall prepare, maintain and follow Storm Water prevention Plan. The Plan shall include Contractor's Best Management Practices (BMP) describing means and methods to control sediment, erosion and other pollutants.

- d. Contractor shall keep BMP Program at job-site.

PART II - PRODUCTS – Not Applicable to this Section

- 2.01 Polyethylene: Polyethylene used for critical barriers and for sealing walls, floors or ceiling systems shall be a minimum of 6 mil thickness and fire retardant type listed by Fire Underwriters Laboratories, Griffolyn #T55R with Griffolyn fire retardant tape, or equal, (no known equal).

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01560

UCDMC CONSTRUCTION DUST & HAZARDOUS MATERIALS INSPECTION WORKSHEET – APPENDIX A

ICRA Permit Number	ICRA Class
Job # and Name	Project Manager
Estimated Start	Estimated Completion

ACKNOWLEDGEMENT OF HAZARDOUS MATERIALS

Does the project contact hazardous materials (e.g., asbestos, lead, mold, PCBs, mercury)?	Yes / No
Verified How: (e.g., hazmat survey, personal knowledge)	
By Whom: (name & department)	

CONTAINMENT STRATEGIES

Enclosure Types [check all that apply]			
☐	Full Containment (poly over all surfaces not in SOW)	☐	Hard Barriers Required
☐	Isolated Room – Critical Openings Only (seal doors, supply and return registers, etc)		
☐	Mini Containment Cube (only large enough for 1-2 people; aka pop up cube)		
☐	Shrouded Tool with HEPA filtered exhaust		
☐	Glove Box Containment with HEPA filtered exhaust		
☐	Other:		
Negative Pressure Requirements [check all that apply]			
☐	-0.020" wc at all times (24/7) as displayed on mounted manometer		
☐	-0.020" wc at setup with some negative pressure throughout project as displayed on manometer		
☐	Visual Verification of some negative room pressure throughout project		
☐	No negative room pressure required		
☐	Negative pressure in localized HEPA exhausted work area (e.g. shrouded tool, glove box)		
☐	Other:		
Negative Pressure Equipment [check all that apply]			
☐	Onsite Challenge Testing (DOP or particle counting) prior to setup		
☐	Challenge Tested within last 6 months; Equipment has remained onsite at UCDMC		
☐	Single HEPA Unit; exhausted to: ☐ Outdoors ☐ Diffusion Box/Chamber		
☐	Two HEPA Units in Parallel; exhausted to: ☐ Outdoors ☐ Diffusion Box/Chamber		
☐	Other:		
Additional Containment Requirements [check all that apply]			
☐	Ante Room	☐	Masonite Floor Protection
☐	Walk off mats	☐	Protective Clothing
☐		☐	Shoe Covers
☐		☐	Air Scrubber
☐	Other:		

VERIFICATION OF WORK

Type(s) of Inspection Required	Responsible Party
☐ HEPA Equipment Verification	☐ EH&S ☐ Consultant ☐ Other:
☐ Pre-Work Approval Inspection	☐ EH&S ☐ Consultant ☐ Other:
☐ Daily Onsite Oversight	☐ PM ☐ EH&S ☐ Consultant ☐ IOR ☐ Other:
☐ Air Sampling Type: _____ Frequency: _____	☐ EH&S ☐ Consultant ☐ Other:
☐ Demolition Inspection	☐ PM ☐ EH&S ☐ Consultant ☐ IOR ☐ Other:
☐ ICRA Downgrade	☐ PM ☐ EH&S ☐ Consultant ☐ IOR ☐ Other:
☐ Final Visual Approval Inspection	☐ PM ☐ EH&S ☐ Consultant ☐ IOR ☐ Other:

INITIAL INFORMATION AND BENCHMARK CONTAINMENT INSPECTIONS – APPENDIX B

ICRA #	Location	Set Up Date	Electrical Shop Inspection	Pre-Start Inspection (Name, Date, Time)	Post-Demo Inspection (Name, Date, Time)	Downgrade Inspection (Name, Date, Time)	Final Inspection (Name, Date, Time)	Take Down Date

DAILY INSPECTION LOG

(Sheet _____ of _____)

Date & Time	Performed By (Name)	Pressure Reading (+/-)	Acceptable Negative Pressure? (Y/N)	ILSM conditions still met? (Y/N/n/a)	Tack Mat useable? (Y/N)	Interior free of dust/debris? (Y/N)	Containment Integrity Intact (no holes or breaches)? (Y/N)	All ICRA permit conditions met? (Y/N)	Other Issues? (Explain)	Corrective Actions
Example 7/4/16 – 0800	B. Clean	-0.025	Y	Y	Y	Y	Y	Y	N	closed entry door

ENTRY WARNING SIGN WITH PROJECT MANAGER CONTACT INFORMATION – APPENDIX C

CAUTION

**CONSTRUCTION DUST PRECAUTIONS IN USE
DO NOT ENTER**

For More Information Contact the Project Manager

(Name)

Phone Number

(THIS SIGN MUST BE POSTED IN COLOR)

SECTION 01561
AIRBORNE CONTAMINANTS CONTROL

PART I - GENERAL

1.01 SUMMARY

1.02 POLICY

- A. Airborne contaminants control is critical in all hospital areas. Contractor shall limit dissemination of airborne contaminants produced by construction-related activities, including dust, chalk, powders, aerosols, fumes, fibers and other similar materials, in order to provide protection of immuno-compromised and other patients, staff, diagnostic operations, or sensitive procedures or equipment, from possible undesirable effects of exposure to such contaminants.
 - 1. Construction activities causing disturbance of existing dust, or creating new dust, or other airborne contaminants, must be conducted in tight enclosures cutting off any flow of particles into patient areas.
 - 2. Ceilings, walls in Protection Areas and other areas in patient care areas as indicated on drawings must be secure at all times.
- B. An Infection Control Risk Assessment (ICRA) and plan to mitigate dust is required for each project. The risk assessment identifies patient groups at risk for infection due to construction dust. The dust mitigation plan is designed to contain dust within the construction zone.
- C. If visible mold is found during construction, renovation, or repairs, any ICRA in-hand is invalid and risk assessment shall be performed to reevaluate ICRA levels and the work plan prior to restart of the work. Upon discovering, seal any openings, stop work and notify the UCDHS Representative immediately. This includes projects that are already considered and operating under a Class IV.
- D. Related Sections:
 - 1. Section 01730 – CUTTING AND PATCHING: Removal of debris may be outside of normal work hours and shall be in tightly covered containers.
 - 2. Section 01350 – SPECIAL PROCEDURES: Perform work in accordance with requirements of this section.
 - 3. Section 01510 – TEMPORARY UTILITIES: Provide high efficiency particulate air (HEPA) filters as specified in Section 01561, negative pressure ventilation, or special control of existing system as determined by University's Representative.
 - 4. Section 01560 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS: Extend barriers above ceilings as required to seal off and contain airborne contaminants.
 - 5. Section 01560 – TEMPORARY CONTROLS: Contain waste materials during removal; bagging, wrapping, and transporting.

6. Section 01740 – CLEANING: Use wet cleaning methods and HEPA filtered vacuum cleaners as required to minimize release of airborne contaminants. Contain waste materials, debris and rubbish as noted above. Disinfect Containment and Protection Areas as directed by University's Representative

E. Dust Mitigation Requirements

1. An ICRA Daily Compliance Survey is attached at the end of this section. The Contractor must complete this daily checklist and leave posted for the duration of the project at the outside of the containment. Any areas of non-compliance must be specifically listed and addressed for corrective measures when identified. A copy of the daily ICRA inspections shall be submitted to the University's Representative at an agreed upon time between the contractor and the Project Manager.

1.03 SUBMITTALS

- A. Submit to Project Inspector or Post at Anteroom Daily ICRA Compliance Survey.
- B. Schedules: Submit work areas and procedure schedules for containment of airborne contaminants.
- C. Work Plan: Drawings and details of construction of necessary temporary barriers, and description of procedures to be used to achieve and maintain control of construction-related airborne contaminants. As applicable, the drawing should include the following: location of ante room(s), location of manometer, location of negative air units exhausting outside the building including number of negative air units and sizes (cfm), and location of sealed blocked off areas of corridors. Any impacts to corridors will need to be approved via ILSM (see specification section 01350 for details).
- D. Project Experience and Training: In order to be considered qualified to work with negative pressure containments; contractors must demonstrate experience by providing either of the following:
 1. Previously completed, documented negative pressure containment work in a healthcare facility along with an owner reference. Minimum documentation shall include project descriptions and photographs or containment schematics.
 2. Documentation that the contactors' proposed foreman has successfully obtained one of the following from the American Society for Healthcare Engineering (ASHE):
 - a. Certified Healthcare Constructor (CHC) Certification
 - b. Health Care Construction (HCC) Certificate
 - c. Managing Infection Prevention During the Construction & Operation of Health Care Facilities Course Completion

1.04 QUALITY CONTROL

- A. Pre-construction Meeting: Before any construction on site begins, Contractor's Superintendent is required to attend a mandatory pre-construction orientation session held by University's Representative for a review on precautions to be taken.
- B. Review by PO&M HVAC staff for possibility to disconnect air supply and return into the project area. Negative air machines shall be connected to separate electrical circuits.
- C. Notification: A minimum of fourteen (14) calendar days written notification to University's Representative of possible construction activity causing airborne contaminants in Protection Areas.

1.05 DEFINITIONS

- A. Containment Areas: As determined by University's Representative and if shown. Includes all areas of construction activities, adjacent staging and storage areas, and passage areas for workers, supplies and waste. The containment area includes ceiling spaces above and adjacent to construction activities.
- B. Critical Openings – Include all potential paths for air and contaminants to move from the project area to outside of the project area and include: supply registers, return registers, exhaust registers, doors, windows, and other openings within the area where contaminants can escape. Sealing the critical openings can be accomplished with tape, plastic, hard barriers and a combination of these materials to seal airtight the critical opening.
- C. HEPA System DOP Testing – An ANSI / ASTM recognized method to test the integrity of a High Efficiency Particulate filter which filters out 99.97% of particles 0.3 micrometers or larger. DOP testing is performed by specialty contractors. The Health System requires that HEPA systems be tested to the ANSI / ASTM standard as delivered prior to their use onsite as further described in this Standard.
- D. ICRA (ICRA) Infection Control Risk Assessment - An evaluation of patient risk based on a matrix of the patient population health in the work area and the invasiveness of the project. This assessment ultimately generates a permit issued by Infection Prevention requiring compliance with one of four precaution levels. The ICRA program is documented in Hospital P&P 2120. ICRAs apply to patient care areas and their adjoining contiguous areas. All ICRA evaluations are the sole responsibility of the Health System Infection Prevention Department based on an application by the Project Manager.

1.06 PERFORMANCE REQUIREMENTS

- A. University's Representative's Responsibilities:
 - 1. Determination of the Containment and Protection Areas, as well as, the standard of limitations of the Contractor's responsibilities, required for the project.
 - 2. Statement of Requirements: Description in graphic and written form as required to communicate the above based on evaluation of the construction area and the impact of the project on patient care.
 - 3. Coordinate any testing and monitoring as necessary with EH&S or a third party.

B. Contractor Responsibilities:

1. Provide specific means and methods of achieving and maintaining control of airborne contaminants during construction.
2. Implement all mitigation measures as listed in the UCDMC Construction Dust & Hazardous Materials Inspection Worksheet, which have been reviewed and approved by Infection Prevention and EH&S. The work shall be performed in accordance with the specific ICRA/Dust Mitigation Plan, Class IV.
3. Contractor shall ensure that all workers are trained and adhere to the mitigation requirements.
4. Contractor shall notify University's Representative in writing, a minimum of fourteen (14) calendar days prior to starting construction activity, which might be expected to produce excess levels of airborne contaminants in containment area so that additional precautions may be taken.

PART II - PRODUCTS

2.01 MATERIALS

- A. Polyethylene: Polyethylene used for critical barriers and for sealing walls, floors or ceiling systems shall be a minimum of 6 mil thickness and fire retardant type listed by Fire Underwriters Laboratories, Griffolyn #T55R with Griffolyn fire retardant tape, or equal, (no known equal).

PART III - EXECUTION

3.01 PROJECT SPECIFIC REQUIREMENTS: The below criteria shall be applied on a case by case basis as outlined in the project specific requirements, ICRA Permit(s), and EH&S Worksheet(s)

- A. Refer to the ICRA Permit(s) and EH&S Work Sheet(s)
- B. All Containment Areas: The project area includes asbestos abatement that will include visual inspections and clearance air sampling for asbestos during the abatement phase of the project. During asbestos abatement, the requirements for -0.020" wp negative pressure work containments apply. After asbestos abatement is complete, general dust and odor control will be required during all new construction using the same -0.020" wp negative pressure.
- C. Attached to this document, there is an option of a general work plan that satisfies all UCDMC ICRA Class IV requirements, Federal and local Asbestos regulations, and Fire and Life Safety Requirements to complete the asbestos abatement of the asbestos containing fireproofing.
- a. The work plan is based on 3 general phases of work.
 - b. The first phase of work includes setting up a full negative pressure enclosure that meets all UCDMC ICRA Class IV requirements, asbestos regulations, and Fire and Life Safety Requirements.
 - c. This full negative pressure enclosure will need to have a minimum of two layers of 6 mil poly on the ground and on any building materials that are not going to be removed or cannot be cleaned (typically porous items).

- d. The asbestos contractor is to make a full negative pressure enclosure around the entire construction area by extending any poly pony walls above ceiling to create negative pressure within the containment.
- e. A three stage decontamination chamber with a working shower will be required at the front entrance. Viewing windows (per the SMAQMD) are required at all the entrance/exits or places where a window can allow visual access to inside of the containment.
- f. A digital manometer will be required at the entrance to the containment where a minimum of -0.020" of water column pressure will be required to be maintained at all times. The manometer shall have a sensitivity that can read down to a minimum of -0.001 " wp.
- g. Exhaust for the negative air machines (that have been DOP tested on site) can be exhausted out of the perimeter windows.
- h. The asbestos abatement contractor is to remove/demolish all HVAC/plumbing/electrical and ceiling systems that are scheduled to be demolished (see demolition drawings).
- i. After all of the demolition of the HVAC/plumbing/electrical and ceiling systems, other trades/inspectors/UCDMC staff that are asbestos trained and wearing the appropriate PPE can enter the space to mark any areas or collect necessary measurements.
- j. The asbestos abatement contractor then moves to Phase 2 (see Phased drawing attachment).
- k. The asbestos abatement contractor is to abate each of the 3 areas that are listed on the Phase 2 map in yellow one location at a time. The Fire Life Safety Officer (FLSO) has allowed for the allotted square footage in each of these marked off areas to be removed and replaced with clean fireproofing within a 5 working day period.
- l. After the fireproofing has been replaced by the fireproofing trade and has been inspected, then the asbestos abatement contractor can move to the next area and repeat this process until all areas are completed. The fireproofing trade and any construction inspectors/UCDMC staff/ UCDMC representatives will need to be asbestos trained and wearing the appropriate PPE.
- m. After the completion of all 3 areas, the asbestos abatement contractor is to extend 6-mil poly pony walls above the ceiling to section off the green shaded area from the yellow shaded areas (see Phase 3) and any other areas where there is asbestos containing fireproofing and where the air space can communicate above the ceiling to areas of non-asbestos fireproofing in Phase 3 above ceiling.
- n. After installing the 6-mil poly pony walls above ceiling to separate the air space between the asbestos containing and non-asbestos containing fireproofing areas, the asbestos abatement contractor is to perform a final clean of the containment that contains the non-asbestos containing fireproofing (everywhere in green shaded area on Phase 3 Drawing).

- o. The UCDCMC Environmental Consultant is to return to complete a final visual inspection and clearance air sampling within this area.
 - p. After passing the final visual inspection and clearance air sampling, the green shaded area from Phase 3 will be considered a clean area.
 - q. Work will/may continue inside of the yellow shaded areas where a combination of trades may perform work above ceiling and spot abatement of fireproofing may be required.
 - r. There will be a minimum requirement of a two stage decontamination chamber system at the entrances to the yellow shaded areas on the Phase 3 drawing. If more than 9 square feet of asbestos containing fireproofing needs to be removed, then there will be the added requirement of having a three stage decontamination chamber system with a working shower installed in accordance with Cal/OSHA.
 - s. This yellow shaded area will require all who enter to be asbestos trained and wear the appropriate PPE.
 - t. After all work is completed within the yellow area, the asbestos abatement contractor is to spray a bridging and penetrating encapsulant with a UCDCMC approved color tint over the asbestos containing fireproofing that will remain in these areas.
 - u. The ceiling systems need to be replaced in these areas and then the asbestos abatement contractor can perform their final clean.
 - v. The UCDCMC Environmental Consultant is to return to complete a final visual inspection and collect clearance air samples.
 - w. After these containments pass the visual inspection and clearance air sampling re-occupancy requirements, then the containments can be removed.
 - 1) Entek recommends keeping the 6-mil poly pony walls extended above the ceiling in the areas that still have asbestos containing fireproofing so the air space does not re-contaminate the surrounding areas until project completion. This recommendation is to avoid trades and other peoples to be asbestos trained and wear the correct PPE while looking above ceiling in majority of the remaining project area.
- D. Final cleaning of Containment: Final cleaning of the work area following completion of the new construction will be required under these ICRA requirements.
- E. Particle Counting: In addition to the final visual inspection for any three dimensional dust in the work area, particle counting will be performed to supplement the visual inspection for acceptable final cleaning assessment of the containment.

3.02 CONTAINMENT CRITERIA

- A. The outside of the work containment shall have present: ICRA Permit, Interim Life Safety Measure (ILSM) Permit, Daily ICRA Inspection Forms, manometer, entry warning sign, Containment Entry Log (provided by the contractor) that lists all persons who enter the

containment regardless of affiliation, including all UC employees, an emergency telephone number of person to call 24 hours a day in the event of a negative pressure alarm or other issue, and that an Environment of Care Incident Report under the category of "Construction Dust" must be filed by area nursing management in case of constant or annoying alarms.

- B. The interior of the containment area shall be cleaned on a continual basis daily. Hard surface floors in work area, adjacent hallways and passage areas require vacuuming with HEPA-filtered vacuum cleaners and frequent wet-mopping during demolition and construction; protect adjacent carpeted areas with plastic and plywood and vacuum with HEPA-filtered vacuum cleaners. Only an EPA Listed Germicide approved by the UCDMC Infection Prevention shall be used on the project site.
- C. Regardless of containment strategies, execute work by methods to minimize raising dust from construction operations. Water may be used to assist in controlling airborne dust.
- D. Full containment
 - 1. All surfaces in the containment area except surface where work is to occur must be covered in plastic unless they are non-porous, smooth, and accessible for cleaning.
 - 2. Sealing of Openings: Use tape or other impenetrable sealant to seal barrier wall seams, cracks around window and door frames, exhaust system ductwork, pipes, joints and ducts. Use of spray glue is not acceptable to be used inside of the building.
 - 3. Contractor must block off existing ventilation supply registers, return registers and exhaust registers in the construction area.
 - 4. All polyethylene and other materials used for temporary enclosures shall be at least 6 mil thickness and fire retardant type. Zip poles or other easily removable supports shall be used for projects extending beyond one work shift. Temporary walls with metal stud framing may be required for long term projects and must be approved by the Project Manager. All doors leading into the containment area shall utilize zippered doors for control of the air flow and closing the plastic doors.
- E. Critical seal of areas
 - 1. Use tape or other impenetrable sealant to seal barrier wall seams, cracks around window and door frames, exhaust system ductwork, pipes, joints and ducts. Use of spray glue is not acceptable to be used inside of the building.
- F. Cubes
 - 1. Mini-containments (pop-up cubes) which are designed to have at most 1-2 people are means of control to access attic spaces, wall spaces and subfloor spaces usually at defined entry points such as access hatches or above a drop-in ceiling system. Cubes are reviewed and approved by the university's representative on a case by case basis.
- G. Glove Boxes
 - 1. A glove box can be used for some work where a HEPA filtered vacuum is attached to the glove box when a small area of work is to be performed. A glove

bag is attached to the box enclosure to allow the worker to make small openings by drilling or cutting within the negative pressure glove box. Glove boxes are reviewed and approved by the university's representative on a case by case basis.

H. Shrouded tools

1. Shrouded tools can be used for some work. A HEPA (DOP Tested) filtered vacuum is attached to the shroud. Shrouded tools are reviewed and approved by the university's representative on a case by case basis.

3.03 NEGATIVE AIR CRITERIA

- A. Under no circumstances shall the HEPA filtered air be discharged into existing HVAC returns, exhaust ducting or building plenum spaces.
- B. When the air from the HEPA filtered negative air unit exhaust cannot be directed outside of the building due to no windows in the vicinity of the work or if impractical, all HEPA filtered negative air units shall be exhausted to a location agreeable to the PM. Each HEPA unit shall be plugged into a separate electrical circuit to provide temporary redundancy should one unit fail or due loss of electrical power. The PO&M Electrical shop shall inspect and test each circuit connected to the HEPA negative air unit prior to use.
- C. When the air from the negative air units are exhausted inside of the building, the exhaust air from negative air unit shall be directed into a "diffusion cube" constructed of pleated filters to disperse the air in a manner that does not raise dust or blow air directly onto patients, staff or visitors. The contractor shall consider and install charcoal filters in the negative air units to control smells/odors associated with the construction.
- D. Negative air units shall be positioned as far from the entry ante room containment as possible for distribution of air flow throughout the project area. The number of negative air units shall be to provide sufficient negative pressure and for a minimum of at least four (4) air changes per hour of the volume of the entire work containment.
- E. Dual HEPA Units operating in parallel may be required for redundancy in high risk areas.
- F. DOP testing of HEPA equipment
 1. Negative air units and HEPA filtered vacuums are to be challenge tested onsite by the DOP test method by a third party prior to being placed in service, after a HEPA filter change, when dropped or damaged or moved from the project site. Only HEPA systems that pass the challenge DOP testing can be used on the project. All HEPA equipment shall be tested per ANSI/ASME N510 Section 10 to ensure 99.97% efficiency at 0.3 micrometer mean aerodynamic diameter.
 2. The entire piece of HEPA equipment shall be challenge tested, not just the filter media. The University's Consultant or EH&S shall witness the HEPA challenge testing procedure in entirety. Once the HEPA system passes the challenge testing and passes, the HEPA equipment may be used at the location tested for a period not to exceed one year. The testing label shall remain on the HEPA equipment and remain legible. Re-testing of the HEPA equipment is required annually, if the piece of equipment is transported out of the building to another building location on the campus, if dropped, or otherwise subjected to forces that

might unseat the HEPA filter, damaged by water or laceration of the filter or if HEPA filter maintenance or adjustments are performed.

3. When utilizing HEPA Filtered Vacuums for glove boxes or shrouded tools these HEPA Vacuums must be DOP tested.

3.04 NEGATIVE AIR MONITORING CRITERIA

A. Fully Monitored Negative Air Maintaining -0.020" Water Column (in-WC)

1. Build containment with negative air machines capable of maintaining a pressure differential of -0.020 in-WC across all critical barriers. This will be required during asbestos abatement and during the new construction.
2. Demonstrate negative pressure is achieved continuously (24/7) by means of an electronic manometer sensitive to measure down to -0.020" wp. An Omniguard IV recording manometer is recommended as the standard instrument for containment pressure monitoring, but other electronic manufactured models with similar sensitivities at low pressures and recording capabilities are acceptable.

B. Hybrid Monitoring and Visual Verification

1. Build containment with negative air machines capable of maintaining a pressure differential of -0.020 in-WC across all critical barriers.
2. During the course of construction, the scope of work may dictate removal of work (e.g. Ceilings or drywall) that would make it difficult to maintain -0.02 in-WC of negative pressure. During working hours Visual Verification of negative pressure may be used in lieu of the -0.02 in-WC requirement with electronic monitoring.
3. At the end of shift all openings must be sealed to bring the containment back to the -0.020 in-WC requirement.

C. Visual Verification

1. The containment shall be visually inspected to verify the plastic is bowed inward to the project area. Tell tail ribbon may also be used to confirm negative pressurization. Visual Verification of negative pressure without the use of a manometer shall be performed upon first entry to the work area, during the course of the work, especially if there are any changes to the work space that may change the negative pressure, prior to taking any breaks and at the end of the work period.

3.05 ADDITIONAL CONTAINMENT CRITERIA

A. Ante Room

1. An ante room is a separate chamber attached to the containment area with zippered doors to allow entry and exit into the containment area. During asbestos abatement, the ante room will consist of three chambers; clean room, shower and dirty room. Entry into the containment area shall be only via the ante room. The ante room is commonly constructed of zip poles or equivalent, plastic and tape. The ante room is sized for each project to allow workers and equipment to be moved into and out of the containment area. A sticky mat is required in the ante room for workers and carts on wheels to use when exiting the ante room

from the containment area. The zippered doors are to remain closed or adjusted slightly open as necessary to allow negative pressure to be maintained at least - 0.020" water column.

2. The ante room shall have a sticky mat present which is intended to remove any debris from the bottom of work shoes before leaving the ante room into the public area. The sticky mat is not intended to clean debris from the bottom of disposable coveralls or from booties. The sticky mat layers shall be replaced many times during a work shift when work involves movement of many workers and supplies out of the containment area. The contractor is responsible for removing a dirty sticky mat and replacing it with a clean one when it is necessary.
3. Workers entering into the containment area will put on a full body disposable coverall with booties inside of the ante room before entering the containment area. Entry into the ante room requires one of the two zippered doors to be opened at one time to maintain the required negative pressure. After entering the ante room, the zipper shall be closed before leaving the ante room into the containment area.

B. Air Scrubbing

1. The contractor shall place additional HEPA filtered fan units (negative air unit) inside of the project work area and operate them in recirculation mode or "scrub mode" near the final cleaning phase of the project to aide in additional particulate cleaning of the space. These units will circulate air internal to the containment area and scrub the air to reduce the total airborne particle concentrations inside of the containment area.

C. Disposable Coveralls and Booties

1. Disposable coveralls are required in all Class III and IV containment areas and selected to provide protection of street clothes from particulates generated inside of the containment area. Disposable coveralls shall be changed if they become ripped and are no longer serviceable.
2. Proper use of the disposable coveralls, booties and use of the sticky mat shall be followed at all times for all workers and UCDMC employees, when it is required by the ICRA Permit. At no time shall workers leave the containment area wearing disposable coveralls and booties. They are to be removed in the ante room or immediately in front of the ante room within the containment area if it is free and clean of debris. The workers shall remove all disposable coveralls and booties and place them in the plastic garbage bag and leave the ante room after walking on the sticky mat.

3.06 CONTAINMENT SET UP

- A. Notify UCDHS Representative forty eight (48) hours prior to containment set up.
- B. Build containment in compliance with ICRA, drawings and plans.
- C. Notify UCDHS Representative and EH&S for inspection prior to start of work. Before any demolition or construction begins, all Protection Areas (infection control areas), control measures put in place and work plan by the Contractor will be inspected by the UCDMC Environmental Health & Safety Personnel, or by a designated representative of UCDMC.

Work cannot begin until the containment area has been inspected and approved, meeting all of the provisions of the ICRA Permit.

3.07 REMOVAL OF CONTAINMENT

- A. Provide thorough cleaning of existing surfaces, which become exposed to dust, before leaving the containment area and before allowing staff and the public access to the project area.
- B. Final cleaning of the containment area requires diligent HEPA vacuuming of all horizontal surfaces and wet wiping all surfaces. Clean towels, sponges, cloth rags or other means shall be used with clean water to effectively clean all surfaces within the containment area. Use of a measured solution of an EPA Listed Germicide is required as part of the final detail cleaning.
- C. Additional HEPA filtered negative air units may be installed for scrubbing of particles (see 3.05 B).
- D. Coordinate with the UCDHS Representative to call for a final visual inspection of the containment area. The final visual inspection will be made after the contractor has thoroughly cleaned the entire containment area. The contractor will be allowed to remove the containment barriers after the interior has passed the visual inspection for cleanliness.
- E. Particle count assessment may be made inside of the containment area by the University's Representative as part of the final visual inspection process in addition to the final visual inspection. Particle testing will include testing the airborne concentration of various particle sizes compared to the concentration outside of the containment area. If particle counts inside of the containment area are significantly greater than outside of the containment area, the contractor shall continue to scrub the air inside of the project area with HEPA filtered negative air units and conduct additional surface cleaning until subsequent particle testing has demonstrated particle concentrations inside of the containment area are not significantly greater than particle concentrations immediately outside of the containment area.

3.08 ENTRY/EGRESS

- A. Entry into the project containment area shall be through the ante room. Entry into the ante room requires one of the two zippered doors to be opened at one time to maintain the required negative pressure. After entering the ante room, the zipper shall be closed before leaving the ante room into the containment area. Equipment and supplies brought into the containment area shall be in sealed leak tight containers inside of rolling covered carts. Equipment, tools and supplies brought into the building shall be clean and free of dust, debris, mold and other contaminants. Cardboard products shall not be brought into the containment area if they are water damaged or have suspect mold growth.
- B. All HEPA equipment when transported into and out of the containment area shall be cleaned of all debris on the surfaces and shall have the intake openings sealed with plastic and duct tape.
- C. All workers leaving the containment area shall leave in clean clothes. At no time shall disposable coveralls or booties be worn when leaving the containment area through the anteroom into the public area. The workers shall clean all gross particulate debris from the coveralls using a HEPA filtered vacuum. Disposable coveralls can be taken off after gross debris has been removed from the disposable coveralls. The worker shall remove

the disposable coverall inside of the ante room by rolling the disposable coverall inside out and then place it into a garbage container (plastic bag) located inside of the ante room or just inside of the project work area.

- D. All equipment and supplies leaving the containment area shall be cleaned of all dust and debris before leaving the containment area. Removal of supplies, materials and waste debris from the containment area shall be using tightly covered containers/carts that contain the waste material. The wheels of carts shall be cleaned on a frequent schedule to minimize track-out of debris as they are removed from the containment area. All waste material shall be in sealed leak tight containers. If plastic bags are used, they shall be 6 mil thick at a minimum.

3.09 ENFORCEMENT

- A. Failure to maintain required containment will result in issuance of written warning; if situation is not corrected within eight (8) hours of receipt of warning, University will have cause to stop the work as provided in Article 2.1 (if Brief Form) or 2.3 (if Long Form) of the General Conditions. Any egregious violation of safety requirements shall be grounds for Immediate Work Stoppage.

END OF SECTION 0156

**INFECTION CONTROL RISK ASSESSMENT
MATRIX OF PRECAUTIONS FOR CONSTRUCTION & RENOVATION**

Project Title: _____

Project No.: _____

Location: _____

Scope of work: _____

Step 1:

Using the following table, **identify** the Type of Construction Project Activity (Type A-D)

TYPE A	Inspection and Non-Invasive Activities Includes, but is not limited to: - removal of ceiling tiles for visual inspection only, e.g., limited to 1 tile per 50 square feet - painting (but not sanding) - wall covering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection
TYPE B	Small scale, short duration activities which create minimal dust Includes, but is not limited to: - installation of telephone and computer cabling - access to chase spaces - cutting of walls or ceiling where dust migration can be controlled
TYPE C	Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies Includes, but is not limited to: - sanding of walls for painting or wall covering - removal of floor coverings, ceiling tiles and casework - new wall construction - minor duct work or electrical work above ceilings - major cabling activities - any activity which cannot be completed within a single work shift
TYPE D	Major demolition and construction projects Includes, but is not limited to: - activities which require consecutive work shifts - requires heavy demolition or removal of a complete cabling system - new construction

Step 1: _____

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Step 2:

Using the following table, **identify the Patient Risk Groups** that will be affected. If more than one risk group will be affected, select the higher risk group:

Low Risk	Medium Risk	High Risk	Highest Risk
Office Areas	- Cardiology - Echocardiography - Endoscopy - Nuclear Medicine - Physical Therapy - Radiology/MRI - Respiratory Therapy	- CCU - Emergency Room - Labor & Delivery - Laboratories (specimen) - Medical Units - Newborn Nursery - Outpatient Surgery - Pediatrics - Pharmacy - Post Anesthesia Care Unit - Surgical Units	- Any area caring for immunocompromised patients - Burn Unit - Cardiac Cath Lab - Central Sterile Supply - Intensive Care Units - Negative pressure isolation rooms - Oncology - Operating rooms including C-section rooms

Step 2: _____

Step 3: Match the

- **Patient Risk Group (Low, Medium, High, Highest)** with the planned...
- **Construction Project Type (A, B, C, D)** on the following matrix to find the...
- **Class of Precautions (I, II, III, IV)** or level of infection control activities required.
- **Class I-IV or Color-Coded Precautions are delineated on the following page.**

IC Matrix – Class of Precautions: Construction Project by Patient Risk

Patient Risk Group	Construction Project Type			
	Type A	Type B	Type C	Type D
LOW Risk Group	I	II	II	III / IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III IV	IV
HIGHEST Risk Group	II	III / IV	III / IV	IV

Note: INFECTION CONTROL APPROVAL WILL BE REQUIRED WHEN CONSTRUCTION ACTIVITY AND RISK LEVEL INDICATE THE CLASS III OR CLASS IV CONTROL PROCEDURES ARE NECESSARY.

Step 3: _____

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DESCRIPTION OF REQUIRED INFECTION CONTROL PRECAUTIONS BY CLASS

Class	During Construction Project	Upon Completion of Project
I	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection.	1. Clean work area upon completion of task.
II	1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area 6. Remove or isolate HVAC system in areas where work is being performed.	1. Wipe work surfaces with cleaner/disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 4. Upon completion, restore HVAC system where work was performed.
III	1. Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Contain construction waste before transport in tightly covered containers. 5. Cover transport receptacles or carts. Tape covering unless solid lid.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Department. 2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 3. Vacuum work area with HEPA filtered vacuums. 4. Wet mop area with cleaner/disinfectant. 5. Upon completion, restore HVAC system where work was performed.
IV	1. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Dept. 2. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction. 3. Contain construction waste before transport in tightly covered containers. 4. Cover transport receptacles or carts. Tape covering unless solid lid. 5. Vacuum work area with HEPA filtered vacuums. 6. Wet mop area with cleaner/disinfectant. 7. Upon completion, restore HVAC system where work was performed.

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Step 4: Identify the areas surrounding the project area, assessing potential impact

Unit Below	Unit Above	Lateral	Lateral	Behind	Front
Risk Group	Risk Group	Risk Group	Risk Group	Risk Group	Risk Group

Step 5: Identify specific site of activity e.g., patient rooms, medication room, etc.

Step 6: Identify issues related to: ventilation, plumbing, electrical in terms of the occurrence of probable outages.

Step 7: Identify containment measures, using prior assessment. What types of barriers? (e.g., solids wall barriers, etc.); Will HEPA filtration be required?

(Note: Renovation/construction area shall be isolated from the occupied areas during construction and shall be negative with respect to surrounding areas)

Step 8: Consider potential risk of water damage. Is there a risk due to compromising structural integrity? (e.g., wall, ceiling, roof, etc.)

Step 9: Work hours: Can or will the work be done during non-patient care hours?

Step 10: Do plans allow for adequate number of isolation/negative airflow rooms?

Step 11: Do the plans allow for the required number & type of hand washing sinks?

Step 12: Does the infection prevention & control staff agree with the minimum number of sinks for this project? (Verify against FGI Design and Construction Guidelines for types and area)

Step 13: Does the infection prevention & control staff agree with the plans relative to clean and soiled utility rooms?

Step 14: Plan to discuss the following containment issues with the project team, e.g., traffic flow, housekeeping, debris removal (how and when), etc.

APPENDIX: IDENTIFY AND COMMUNICATE THE RESPONSIBILITY FOR PROJECT MONITORING THAT INCLUDES INFECTION PREVENTION & CONTROL CONCERNS AND RISKS. THE ICRA MAY BE MODIFIED THROUGHOUT THE PROJECT. REVISIONS MUST BE COMMUNICATED TO THE PROJECT MANAGER.

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SECTION 01562

REQUIREMENTS FOR CEILING ACCESS TO SPACES CONTAINING ASBESTOS

PART I – PURPOSE

This section outlines policy and procedures for access to ceiling spaces containing or suspected of containing asbestos fireproofing, thermal insulation, or other asbestos containing material.

PART II – POLICY

Work that may disturb asbestos but is not intended to result in intentional asbestos removal shall be controlled in accordance with this section, as well as, Cal/OSHA requirements for Class III asbestos work contained in 8 CCR 1529 and general requirements of 8 CCR 5208. Moving ceiling tiles or horizontal hatches to access ceiling spaces with asbestos fire proofing or containing debris from asbestos thermal insulation is Class III asbestos work. The university representative may approve modifications to these procedures. This section outlines minimum requirements. Controls that exceed these requirements may be used.

PART III – PROCEDURES

A. Training

Personnel performing work in spaces containing or suspected of containing asbestos material shall have training which meets the requirements of Cal/OSHA Class III asbestos work that is specific to the work task to be completed.

B. Competent Person

During work in asbestos contaminated attic spaces, an asbestos Competent Person, as defined by 8 CCR 1529, shall be present at all times to oversee safe access and control measures. A Competent Person shall inspect the area to assure the controlled work area is properly established, and to determine that appropriate cleanup has occurred at the end of the work task.

C. Standard Access/Egress Procedures From Mini-enclosure

1. Access into an attic space with asbestos shall be completed using a manufactured mini-enclosure, or an equivalent enclosure constructed on site. Use of a small HEPA filtered negative air unit attached or integrated with the mini-enclosure to create negative pressure in the enclosure is required. A HEPA filtered vacuum shall be present and available for use in the mini-enclosure. The mini-enclosure must be posted with the asbestos warning sign in accordance with Cal/OSHA Title 8 CCR 8 1529. Access into the enclosure must be restricted to trained personnel, who are required to wear full body coveralls and a respirator approved for asbestos. A sticky mat shall be present immediately outside of the mini-enclosure. Any debris generated by work activity must be cleaned up using a HEPA vacuum and wet wiping techniques.
2. Disposable full body coveralls are required in all ICRA Class III and IV containment areas and shall be selected to provide protection of street clothes from particulates generated inside of the containment area. All work inside a mini-enclosure for asbestos related work is considered ICRA Class III or IV. Disposable coveralls shall be changed if they become ripped and are no longer serviceable.

3. Proper use of the disposable coveralls and use of the sticky mat shall be followed at all times for all workers and UCDMC employees, when it is required by the ICRA Permit. At no time shall workers leave the mini-enclosure wearing soiled disposable coveralls and booties. At times, in select areas requiring sterile environments, it may be necessary to change from soiled disposable clothing into clean disposable clothing before exiting containment. Coveralls and booties are to be removed inside the mini-enclosure and placed into a plastic asbestos waste bag before leaving the mini-enclosure.

D. Air Sampling

Air sampling is required per 8 CCR 1529 to assess asbestos exposures when the project requires workers to enter the attic space. The air sampling frequency shall be sufficient to assess all work activities in the mini-enclosure and in the attic space and may include both 30 minute Excursion sample periods and longer sampling periods.

E. Debris Clean-up

All debris inside of the mini-enclosure shall be cleaned up promptly by HEPA vacuuming and wet wiping techniques and before each time the mini-enclosure is moved.

F. Personal Protective Equipment

All personnel entering the attic space with asbestos shall wear full body disposable coveralls (e.g., Tyvek, Kleenguard or equivalent) and a respirator with HEPA (P-100) filter cartridges for asbestos protection (or a respirator offering greater protection).

G. Entering ceiling spaces where asbestos fire proofing (contaminated with assumed or visible asbestos debris) is present (e.g., when personnel must enter the space and "crawl" in the attic space but no asbestos abatement work is planned).

1. Control of disturbance of asbestos debris during work inside of an attic space with asbestos debris shall be followed in all cases, by using a HEPA vacuum to clean-up visible suspect asbestos containing debris in the immediate area of access and work. If practical, vacuum visible debris for the full path of travel. If this is not practical, use other procedures to ensure safe removal of visible debris in the path of travel that would be disturbed by the crawl. For example, wet paper towels and plastic bags may be used to pick up and contain visible debris. The top surface of the attic access panel shall be cleaned of all dust and debris using a wet paper towel before the access hatch panel is allowed to swing down into the suspended position. Other control methods may be used provided they meet the following criteria:
 - dry sweeping is not permitted
 - employees must not walk on, crawl on or otherwise crush visible suspect asbestos containing debris
 - the control method must not result in a release of airborne fibers.
2. If the coverall tears or rips during the work activity, repair or replacement is required. Use duct tape to repair tears or rips to the coverall if feasible, or exit and replace the coverall. Remove and bag coverall in mini-enclosure as in ceiling access procedure. If coveralls were torn, vacuum any noticeable debris from underlying clothing. Use two disposable coveralls to minimize contamination of street clothes when tearing is likely or when crawling on rough surfaces.

H. HEPA Filter Challenge Testing and Certification

All HEPA filtered equipment (including negative air units and vacuums) used must have passed onsite DOP testing within the last 6 months and must be re-certified after filter replacement or if moved offsite, including to another UCDMC building.

I. Access for Inspection after Ceiling Tile has been Removed

Inspection above the ceiling, after a ceiling tile has been moved using a mini-enclosure containment, may be performed with asbestos awareness training. Access of this type is limited to visual inspection through the ceiling opening. Full entry to the space or ceiling crawl must meet the other requirements of this section. Personnel who perform this work must be notified that asbestos is present in the area and of which materials in the area contain asbestos.

J. Asbestos Waste Management

Personnel are required to appropriately bag all asbestos debris, disposable personal protective equipment, and other materials potentially contaminated with asbestos. Bags shall be clear, 6 mil, imprinted with the required asbestos warning label. Appropriate packaging includes double-bagging, and wetting the materials in the inner bag. Each bag shall be legibly marked with UCDMC. EPA ID No. CAD076124981. The Generator address is 2315 Stockton Blvd., FSSB 2500, Sacramento, CA 95817

For those projects generating five (5) or fewer bags of asbestos-contaminated materials, UCDHS Environmental Health and Safety (EH&S) will manage the disposal of the bags; contact EH&S at 916-734-2740 for disposal with at least one week's notice of the intent to dispose. Materials must be bagged and marked as described above prior to EH&S' acceptance.

Asbestos disposal is the responsibility of the Contractor on those projects generating more than five (5) bags of asbestos-contaminated material. If a Uniform Hazardous Waste Manifest is required for transportation, such manifest must be signed by a representative of UCDHS EH&S. Contact EH&S with at least one week's notice of the intent to dispose.

END OF SECTION 01562

SECTION 01 57 13 CONSTRUCTION NOISE CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Methods and procedures to protect building occupants and surrounding area from excessive noise associated with construction work and are referred to as the Noise Control Policy.

1.2 DEFINITION

- A. A-Weighting: A standard frequency weighting which is commonly employed to measure the loudness or "noisiness" of sounds. A-weighting filters the microphone signal in a manner which correlates better with the sensation of the human ear.
- B. A-weighting is required by regulation promulgated by the U.S. EPA, the California Department of Aeronautics, CalTrans, and others. A 10 dB increase in sound level is perceived by people to be twice as loud. All noise data herein are A-weighted. Usually the unit of A-weighted sound level is written as dBA.

1.3 QUALITY ASSURANCE

A. References:

1. San Francisco Noise Ordinance which prohibits the operation of equipment that emits noise in excess of 85 dBA when measured at a distance of 100 feet.

B. Enforcement:

1. Monitor noise levels through measurements to establish levels in excess of 85 dBA at 50 feet, and implementing additional mitigation procedures based on recommendations of acoustical consultant.

1.4 SCHEDULING

- A. Schedule construction work generating severe levels of noise in advance, and set times as required and determined acceptable by Owner.

PART 2 PRODUCTS

2.1 CONSTRUCTION NOISE ASSESSMENT

- A. Construction Noise levels at a distance of 50 feet for each phase of construction are shown below. Data are based on data for similar construction activities and published data.

NOISE LEVELS GENERATED BY CONSTRUCTION ACTIVITIES AT 50 FEET.

Excavation:	Leq (dBA)	LLmax (dBA).
Earthmoving	90	95-100.
Excavation.	90	95-100
Grading.	80	85-90
Foundation:		
Earth Drilling	90	95-100.

Erection:		
Concrete Pouring	85	90-95.
Framing with impact wrenches.	95	100-105
Framing without impact wrenches	85	90-95.
Pre-Construction	90	95- .

PART 3 EXECUTION

3.1 MITIGATION

- A. Attempt to implement the following construction noise mitigation measures on this Project:
1. Equip internal combustion engine-driven construction equipment with good condition best available mufflers. Use quiet electric-powered compressors and generators.
 2. Use welded rather than T.C. bolted steel connections when possible to minimize use of impact wrenches.
 3. Erect barriers around noise generating operations.
 4. Turn off engines and compressors when not in operation; no idling.
 5. Limit noise generating construction activities to times between 7:30 am and 3:30 pm.
 6. Avoid blasting activities. Use ball and crane demolition techniques.
 7. Define truck routes to confine noisy trucks to streets that currently have the heaviest traffic. Develop a truck staging area away from acoustically sensitive areas.
 8. Use an electric-powered tower crane instead of a diesel-powered truck crane.
 9. Use steel structural frames in lieu of concrete structural frames to yield a much shorter assembly time.
 10. Pre-cut metal decks and metal studs off site to minimize on-site sawing.
 11. For excavation, use drilled soldier piles with wood lagging instead of sheet pile driving techniques where possible. Avoid impact pile driving.
 12. Retain an acoustical consultant to provide assistance with developing additional noise attenuation techniques where needed.
 13. Chemically demolish concrete where possible.
 14. Avoid hammer drilling; use coring bits, instead. Avoid using power-actuated fasteners; use concrete screws, instead. Avoid sand blasting.
 15. Avoid sheet metal debris chutes; use plastic chutes, instead.
- B. Contractor is responsible for site supervision of potential sources of noise (e.g., material delivery, shouting, debris box pick-up and delivery) for all trades. Maintain awareness among trades of noise sensitivity of Project.

3.2 FIELD QUALITY CONTROL

- A. Enforcement of Noise Control Policy:
1. Measurements will be taken on an unscheduled basis to document noise levels.
 2. Information will be noted and transmitted to Contractor.
 3. A record of noise violations will be maintained.

END OF SECTION

**SECTION 01610
PRODUCT REQUIREMENTS**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Product Options
- B. Product Substitutions
- C. Product Transportation and Handling Requirements
- D. Product Storage and Protection
- E. Product System Completeness

1.02 RELATED SECTIONS

- A. Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- B. Section 01410 – REGULATORY REQUIREMENTS
- C. Section 01450 – QUALITY CONTROL

1.03 PRODUCTS

- A. Product Selection: Provide products that comply with Contract Documents, are undamaged and unused at installation.
- B. Product Completeness: Provide products complete with all accessories, trim, finish, safety guards and other devices needed for complete installation and for intended use and effect.
- C. Products: Items purchased for incorporation in Work, whether purchased for project or taken from previously purchased stock; this includes materials, equipment, assemblies, fabrications and systems.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model designation indicated in the manufacturer's published product data.
 - 2. Materials: Products that are shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed or installed to form part of the Work.
 - 3. Equipment: A product with operating parts, whether motorized or manually operated, requiring connections such as wiring or piping.
- D. Specific Product requirements: Refer to requirements of Section 01450 – QUALITY CONTROL and other Sections in Division 2 through 16 for specific requirements for products.

- E. Code Compliance: All products, other than commodity products prescribed by Code, shall have current listing service report or research report. Minimum Requirements: Specified requirements are minimum requirements.
- F. Interchangeability: To fullest extent possible, provide products of the same kind from single source. Products supplied in quantity shall be same product and interchangeable throughout the Work. When options are specified for selection of any of two (2) or more products, product selected shall be compatible with products previously selected.
- G. Nameplates: Except for required labels and operating data, do not attach manufacturer's name plates or trademarks on surfaces exposed to view in occupied spaces or on the exterior of building.
- H. Equipment Nameplates: Provide permanent nameplate on each item or service-connected or power-operated equipment. Locate on inconspicuous accessible surface. Nameplate shall contain the following information and essential operating data:
 - 1. Name of product and manufacturer
 - 2. Model and serial number
 - 3. Capacity and Speed
 - 4. Ratings and other pertinent information
- I. Listing Service: Products, for which listing service standards have been established and for which their service label is available, shall bear the appropriate listing service label.

1.04 PRODUCT OPTIONS

- A. Products Specified Only by Description: Where the Contract Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that provides the appropriate characteristics and otherwise complies with the requirements.
- B. Performance Specification: Where Contract Specifications require compliance with performance requirements, provide products that comply and are recommended for application. Manufacturer's recommendations may be contained in Product literature, or by certification of performance.
- C. Compliance with Standards: Where Contract Specifications require compliance with a standard, select a product that complies with the standard specified.
 - 1. Wherever catalog numbers and specific brands or trade names followed by the designation "to match existing or University Standard" are used in conjunction with product(s) required by the Contract Specification, no substitution will be considered.
- D. Products Specified by Naming One (1) or More Manufacturers:
 - 1. Specified manufacturer(s): Provide specified product(s) of the specified manufacturer. Wherever more than one (1) manufacturer's product is specified, the first-named product is the basis for the design used in the Work and the use of alternative-named products or substitutes may require modifications in that

design. If such alternatives are proposed by Contractor and are approved by University, Contractor shall assume all costs required to make necessary revisions and modifications to the design, including additional costs to University for evaluation of revisions and modifications of the design resulting from the substitutions submitted by Contractor.

- a. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and "or equal" supporting data for second manufacturer's product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitution.
 2. Quality Standard: Products(s) of the specified manufacturer shall serve as standard by which the product(s) of other named manufacturers are evaluated.
- E. "Or Equal" Provision: Catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with material and equipment required by Contract Specification to establish standard of quality, utility, and appearance required.
1. "Or Equal" Products: Equivalent products of manufacturers other than the specified manufacturer may be provided if determined by University's Representative to be acceptable in accordance with substitution provisions following:
 - a. Contractor shall submit to University's Representative, within thirty-five (35) days after the date of commencement of the Work specified in the Notice to Proceed, a typewritten list containing descriptions of each product proposed for substitution.
 - b. Contractor shall provide supporting data as required herein.
 - c. University will evaluate Contractor's proposal. The decision of University shall be final.
 - d. University will accept, in writing, proposed substitutions that are in University's opinion equal in quality, utility and appearance to the product specified. Such acceptance does not relieve Contractor from complying with requirement of the Contract Documents.
 - e. Contractor shall be responsible for all costs of any changes resulting for Contractor's proposed substitutions that affect other work, or the Work of Separate Contractor.
 - f. Failure to place orders for specified products sufficiently in advance of required date for incorporation into the Work will not be considered justification for Contractor to request a substitution or deviation from requirements of the Contract Documents. The thirty-five (35) day submittal period does not excuse Contractor from completing the Work within the Contract Time.
 2. Contractor's Determination: Prior to submitting "or equal" product(s) for consideration, Contractor shall review and determine product(s) meet or exceed the quality and warranty provisions of the specified product.

3. Late Substitution Requests: If a request for substitution occurs after the thirty-five (35) day period, the substitution may be reviewed at the discretion of University and the costs of such review, as approved by University, shall be deducted from the Contract Sum.
 - a. Product Availability Waiver: Substitutions will be considered after the thirty-five (35) day period only when a product becomes unavailable due to no fault of the Contractor.
- F. Visual Matching: Where Contract Specifications require matching a sample, University's decision on proposed product match is final. If no product matches and complies with other requirements, comply with provisions for "substitutions" for selection of a matching product in another category.
- G. Visual Selection: Where requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product that complies with other requirements. University will select color, pattern and texture from the product line selected.

1.05 SUBSTITUTIONS

- A. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract shall be considered "substitutions". The following are not considered substitutions:
 1. Revisions to Contract Documents requested by University's Representative or University's Consultant.
 2. Specified options of products and construction methods included in Contract Documents.
 3. Compliance with governing regulations and orders issued by governing authorities.
- B. Substitution Provisions: Requests for Substitutions will only be considered if Contractor submits the following data:
 1. Furnish complete technical data including drawings, performance specifications, samples, test reports and any additional information required by University's Representative, for each product proposed for substitution.
 - a. Submit minimum of four (4) copies.
 - b. In reviewing supporting data for substitution, University will use, for purpose of comparison, all characteristics of specified product as it appears in manufacturer's published data even though all characteristics may not have been particularly mentioned in the Contract Specifications. If more than two (2) substitutions of supporting data are required, University's costs of reviewing additional supporting data will be deducted from the Contract Sum.
 - c. Submit statement indicating substitution's effect on the Construction Schedule, if any.

- d. Submit cost information, including proposal of net deduction, if any, from Contract Sum.
 - 2. Furnish statement by Contractor that proposed substitution is in full compliance with requirements of Contract Documents and Applicable Codes.
 - 3. Furnish list of Subcontractors, if any, that may be affected by the substitution.
 - 4. If proposed substitution requires portions of the Work to be redesigned or removed in order to accommodate substituted product, submit design and engineering calculations prepared by the licensed design professional of record.
 - 5. Contract Document Revisions: Should Contractor-proposed or alternate sequence or method of construction require revision of Contract Documents, including revisions for purpose of determining feasibility, scope or cost, or revisions for the purpose of obtaining approval by governing authorities having jurisdiction, revisions will be made by University's Consultant who is the design professional of record.
 - a. Services of University's Consultants, including time spent in researching and reporting on proposed substitutions or alternate sequences and methods of construction, shall be paid by Contractor when such activities are considered additional services to the design services contracts of University.
 - b. Cost of services by University's Consultants shall be paid on a time and material basis, based on current hourly fee schedules, with reproduction, long distance telephone and shipping costs reimbursable. Such fees shall be paid whether or not the proposed substitution or alternate sequence or method of construction is ultimately accepted by University and Change Order executed. Such fees owed shall be deducted from the Contract sum on the next Application for Payment.
 - 6. Submit all proposed substitutions in writing to University using the Request for Substitution form provided at the back of this Section.
- C. University may reject any substitution not proposed as described above and presented within the time prescribed.
- D. Revisions to submittals: If University's Representative, in reviewing list of substitutions, requires revisions or corrections to previously accepted Shop Drawings and supplemental supporting data, Contractor shall promptly do so. If any proposed substitution is judged by University's Representative to be unacceptable, the specified product shall be provided at no cost to the University.
- E. Samples: Samples may be required. Tests required by University's Representative for determination of quality and utility shall be made by Contractor's independent testing Laboratory, at expense of Contractor, with prior University acceptance of test procedure.

1.06 TRANSPORTATION, DELIVERY AND HANDLING

- A. Transport products by methods to avoid product damage.

- B. Schedule delivery to minimize long-term storage and prevent overcrowding construction spaces. Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
- C. Deliver products in undamaged condition in manufacturer's original sealed container or packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
- D. Provide equipment and personnel to handle products by methods to prevent soiling, marring or other damage.
- E. Promptly inspect products on delivery to ensure products comply with Contract Documents, quantities are correct, and to ensure products are undamaged and properly protected. Promptly remove damaged or defective products from site and replace at no adjustment to the Contract Sum and/or Contract Time.

1.07 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Store products to facilitate inspection and measurement of quantity or counting of units.
- C. Store heavy materials away from structures in a manner that will not endanger supporting construction.
- D. Store sensitive products in weather-tight enclosures. Store products subject to damage by the elements above ground, under cover in a weather-tight enclosure, with ventilation adequate to prevent condensation.
 - 1. Maintain temperature and humidity within range required by manufacturer's instructions.
 - 2. Exterior Storage:
 - a. Store products above ground on blocking or skids to prevent soiling, staining and damage.
 - b. Cover products that are subject to damage by the elements with impervious protective sheet coverings. Provide adequate ventilation to prevent condensation.
 - c. Store sand, rock, aggregate or other loose granular material in well-drained area on solid surfaces. Prevent mixing with foreign matter.
 - 3. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged and maintained under required conditions, free from damage and deterioration.
- E. Protection After Installation: Provide barriers, substantial coverings, notices and other materials or methods as necessary to protect installed work from traffic, subsequent construction operations and weather.

1. Maintain temperature and humidity conditions in interior spaces for Work in accordance with manufacturers' instructions for materials and equipment being protected.
2. Remove protective measures when no longer required and prior to Acceptance of the Work.

1.08 SYSTEM COMPLETENESS

- A. The Contract Drawings and Contract Specification are not intended to be comprehensive directions on how to produce the Work. Rather, the Drawings and Specifications are instruments of service prepared to describe the design intent for the completed Work.
- B. It is intended that equipment, systems and assemblies be complete and fully functional even though not fully described. Provide all products and operations necessary to achieve the design intent described in the Contract Documents.
- C. Contractor is urged to report to University's Representative immediately when elements essential to proper execution of the Work are discovered to be missing or misdescribed in the Contract Documents or if the design intent is unclear.
- D. Should an essential element be discovered as missing or misdescribed prior to receipt of bids or establishing a negotiated Contract Sum, an Addendum or Clarification will be issued so that all cost may be accounted in the Contract Sum.
- E. Should an obvious omission or misdescription of a necessary element be discovered and reported after execution of the Agreement, Contractor shall provide the element as though fully and correctly described.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products.
- B. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01610

REQUEST FOR SUBSTITUTION

Substitution #: _____ Submittal #: _____ Date: _____

A/C #: _____ OSHPD #: _____

PROJECT NAME: _____

TO: UC DAVIS MEDICAL CENTER	FROM: _____
Facilities Design & Construction	_____
4800 2ND Avenue, Suite 3010	_____
Sacramento, CA 95817	_____
P: 916-734-7024	_____
F: 916-734-7751	_____
Attn.: <u>Jim Davis</u>	_____

Name of Party Submitting Request for Substitution: _____

Reason for Submitting Request for Submission: _____

Specification Section and Paragraph #: _____

Substitution Manufacturer name and address: _____

Proposed substitution (trade name of product, model or catalog #): _____

Fabricators and Suppliers (as appropriate): _____

PRODUCT DATA:

ATTACH PRODUCT DATA AS SPECIFIED IN SPECIFICATION SECTION 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

Similar projects using product (list dates of installation and names/phone numbers of Owners):

Similar comparison of proposed substitution with specified product (indicate variation(s), and reference each variation to appropriate Specification Section paragraphs):

-ATTACH COMPARISON SUMMARY-

(SUBSTITUTION REQUEST CONTINUES)

Quality and performance comparison between proposed substitution and specified product:

Availability of maintenance services and replacement materials: _____

Effect of proposed substitution on Construction Schedule: _____

Effect of proposed substitution on other work or products: _____

SECTION 01720 PREPARATION

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Surveying and Field Engineering Services

1.02 RELATED SECTIONS

- A. Section 01450 – QUALITY CONTROL

1.03 REGISTRATION REQUIREMENT

- A. Contractor shall employ civil engineers/land surveyors, which are registered and licensed in the state of California and acceptable to the University.

1.04 LINE AND GRADES

- A. Contractor shall provide all construction survey work required for accurate location of the Work. Horizontal and vertical control for the Work shall be from project reference marks as shown on Contract Drawings. University's decision will be final in all questions regarding proper location of work.
- B. Contractor shall verify final configuration of project during demolition work. Minor adjustments of work to accommodate existing field conditions shall be responsibility of Contractor.
- C. Replace control points that may be lost or destroyed, base requirements on original survey control, at no increase in the Contract Sum.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 INSPECTION

- A. Verify locations of survey control points prior to starting work. Promptly notify University's Representative of any discrepancies discovered.

3.02 SURVEY REFERENCE POINTS

- A. Protect survey control points prior to starting site work; preserve permanent reference points during construction. Make no changes without prior written notice to University's Representative.
- B. Promptly report loss or destruction of any reference point or relocation required to University's Representative. Replace dislocated survey points based on original survey control.

3.03 SURVEY REQUIREMENTS

- A. Establish minimum of three (3) permanent benchmarks on site, referenced to establish control points. Record locations, with horizontal and vertical data, on Project Record Documents.
- B. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements, including pavements, stakes for grading, fill and topsoil placement, utility locations, slopes and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations and ground floor elevations.
 - 4. Controlling lines and levels required for mechanical and electrical work.
 - 5. Verify layouts as Work proceeds to assure compliance with required lines, levels and tolerances.
- C. Periodically certify layouts by same means.

3.04 RECORDS

- A. Maintain complete and accurate log of all control and survey work as it progresses.
- B. On completion of foundation walls and major site improvements, prepare certified survey showing all dimensions, locations, angles and elevations of construction.

END OF SECTION 01720

**SECTION 01730
CUTTING AND PATCHING**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching Work.

1.02 RELATED SECTIONS

- A. Section 01110 – SUMMARY OF THE WORK
- B. Section 01310 – COORDINATION
- C. Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- D. Section 01610 – PRODUCT REQUIREMENTS
- E. Individual Specifications Sections.
 - 1. Cutting and patching incidental to Work specified in this Section.
 - 2. Coordination with work in other Sections for openings required to accommodate Work specified in those other Sections.

1.03 SUBMITTALS

- A. Contractor shall complete and submit for review to University's Representative, a Coring/Sawcutting Form, included at the end of this Section, and obtain written authorization for University prior to the commencement of any dig activities. Contractor shall include all pertinent information with the Coring/Sawcutting Form and submit with detailed work plan fourteen (14) days prior to desired coring/cutting activity.
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of University.
 - 6. Utility supply, drains, fire alarm, communication.
- B. Include in request:
 - 1. Identification of Project, including University's Project Name and A/C number.
 - 2. Location and description of affected Work.

3. Necessity for cutting and patching.
4. Description of proposed work, and products to be used.
5. Alternatives to cutting and patching.
6. Effect on work of University.
7. Written permission of University.
8. Date and time work will be executed.

1.04 NOTIFICATIONS

- A. Before starting welding or cutting work involving the use of gas or electric welding equipment, or any brazing work involving gas or electric brazing equipment Contractor shall complete the online Hazardous Conditions Permit form at <https://health.ucdavis.edu/fire/permits.html> Contractor shall allow seventy-two (72) Hours for Fire Marshal's approval and issuance of Hazardous Conditions Permit. This permit will be issued without cost to Contractor and may be applicable to more than one (1) building. Contractor shall be responsible for reporting to Fire Department either by telephone or in person at beginning and end of each day's work. Provide minimum written notice of fourteen (14) calendar days prior to such activities.
1. Welding and brazing personnel must be certified by a University or OSHDP approved laboratory and must maintain this certification during the work of this Contract.
 2. Contractor is responsible for notifying University of all apparent locations where suspect asbestos containing materials may be present or discovered during the course of the project, such as cement pipes or other insulated material, which may be a result of newly excavated materials below grade or after building systems are opened such as within wall, ceiling or subfloor spaces. When any such location is discovered by Contractor, information relating thereto shall be immediately communicated to University's Representative.
 3. Where welding and cutting activity is required and suspect painted surfaces are present that will be impacted by the welding or cutting activity, the contractor shall request from the University's Representative information regarding laboratory analysis for lead or other hazardous metals in the painted metal components before any cutting or welding is performed. The contractor shall refer to Section 01350 Special Procedures, 1.05 Hazardous Materials Procedures regarding materials impacted by welding and cutting activity.
 4. Contractor shall then follow any and all instructions as indicated by University's Representative.

PART II - PRODUCTS

2.01 MATERIALS

- A. Product substitution: For any proposed change in materials, submit request for substitution under provision of SECTION 01610 – PRODUCT REQUIREMENTS.

PART III - EXECUTION

3.01 EXAMINATION

- A. General: Execute cutting, fitting and patching including excavation and fill, to complete Work and:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install ill-timed work.
 - 3. Remove and replace defective and non-conforming work.
 - 4. Remove samples of installed work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical work.
- B. Examination, General: Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
 - 1. After uncovering existing Work, inspect conditions affecting proper accomplishment of Work.
 - 2. Beginning of cutting or patching shall be interpreted to mean that existing conditions were found acceptable by Contractor.
- C. Ground Penetrating Radar: Determine by Ground Penetrating Radar all existing reinforcing, conduit and piping located in concrete walls and slabs prior to demolition. Clearly mark all locations and review with University Representative prior to demolition.

3.02 PREPARATION

- A. Temporary Supports: Provide supports to assure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Weather Protection: Provide protection from elements in all areas that may be exposed by uncovering work. Maintain excavations free of water.

3.03 CUTTING AND PATCHING

- A. Execute cutting, fitting, and patching to properly complete Work.
- B. Coordinate installation or application of products for integrated Work.
- C. Uncover completed Work as necessary to install or apply products out of sequence.
- D. Remove and replace defective or non-conforming Work.
- E. Provide openings in the Work for penetrations of mechanical and electrical Work.

3.04 PERFORMANCE

- A. Execute cutting and patching by methods to avoid damage to adjoining Work, and that will provide appropriate surfaces to receive final finishing.
- B. Execute cutting and patching of weather-exposed, moisture-resistant and sight-exposed surfaces by methods to preserve weather, moisture and visual integrity.
- C. Restore work with new Products as specified in individual Sections of Contract Documents.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval from University. Coordinate timing of all sawing and cutting work with the University's Representative.
- E. Fit work neat and tight allowing for expansion and contraction. Butt new finishes to existing exposed structure, pipes, ducts, conduit, and other penetrations through surfaces.
- F. At penetrations of firewalls, partitions, ceiling, or floor construction, completely seal voids with UL approved fire-rated assembly. Provide temporary closures at the end of each work day. Closures shall be approved by the University Fire Marshal.
- G. Refinish surface to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish unit.
- H. Where new construction is to join with or match existing work, it shall be finished exactly to that work so as to form a complete unified and finished element.

END OF SECTION 01730

CORING / SAWCUTTING NOTIFICATION

LOCATION: _____ A/C: _____
TITLE: _____

TRACKING NUMBER: _____
(Provided by PO&M)

OSHDP #: _____ DATE: _____

TO: Facilities Design & Construction UC Davis Medical Center 4800 2nd Avenue, Suite 3010 Sacramento, CA 95817 P: 916-734-7024 F: 916-734-7751 Attn.: Jim Davis	FROM:

SCOPE: _____

HAS USA BEEN NOTIFIED? ☐ YES ☐ NO *When?* _____
ARE ALL KNOWN UTILITIES MARKED? ☐ YES ☐ NO *By Whom?* _____
LOCATION OF WORK SHOWN ON ATTACHED SITE PLANS? ☐ YES ☐ NO *Purpose:* _____
DATE(S) CORING OR SAWCUTTING WILL TAKE PLACE: _____ Signed: _____

<u>UCDMC USE ONLY</u>	
DATE RECEIVED: _____	
WHO FROM UCDMC WILL AUTHORIZE, SUPERVISE AND VERIFY? PHONE: _____	
Utilities Verified by IOR?	☐ YES ☐ NO
Activities coordinated with:	☐ PO&M ☐ Fire ☐ Telecom ☐ Occ. Safety ☐ Other (Itemize): _____
COMMENTS: Signed: _____ DATE AUTHORIZED: _____ University Representative PO&M: _____	
COMPLETION DATE: _____	
COMMENTS: (Unknown Utilities Encountered, Disruptions, Successes, Weather, etc.)	
SIGNED: _____	
Copies to: University Consultants, PO&M, Fire, Telecom, File, Others: _____	

SECTION 01 73 25 SEISMIC RESTRAINT REQUIREMENTS FOR NONSTRUCTURAL COMPONENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide seismic restraint of nonstructural components to withstand seismic forces and seismic deformations without displacing or overturning. For designated nonstructural components, provide installations capable of providing post-earthquake functionality.
- B. Work in this section includes furnishing and installing complete seismic restraint systems including the seismic restraint requirements of OSHPD PIN 68. Work in this section may also include the seismic restraint design and/or equipment/product certifications to be submitted for review by the registered design professional.

1.2 SCOPE

- A. The architectural, medical equipment, mechanical, electrical, and plumbing components and systems identified in the attached Responsibility Matrix shall be designed and constructed for seismic demands.

1.3 DEFINITIONS

- A. Professional Engineer - A professional engineer is one who is legally qualified to practice in the jurisdiction where the Project is located, who is experienced in providing engineering services of the kind indicated and is registered with the state where the Project is located.
- B. Seismic Forces: Forces acting in any direction on a nonstructural component and related system due to the action of an earthquake as defined in the Building Codes currently in effect where the Project is located.
- C. Seismic Deformations: Drifts, deflections and seismic relative displacements determined in accordance with the applicable seismic requirements of the Building Codes currently in effect where the Project is located.
- D. Restraint/Bracing: Bracing or anchorage used to limit movement under seismic forces. Cables or rigid elements (strut, pipe, angles, etc) used to resist forces by uniaxial tension or compression. The term "bracing" may also be used to describe design to resist lateral forces through the use of wall or frame elements.
- E. Support: Elements used to support the weight (gravity load) of an item. Where the support is located at a seismic brace, the element may also resist tension/compression reactions from the restraint system.
- F. Anchorage: Connection to structure typically through the use of welding, bolts, screws, post-installed anchors or other fasteners selected to meet the Building Codes currently in effect where the Project is located.
- G. Designated Seismic System: Those architectural, electrical and mechanical systems and their components that require seismic design in accordance with ASCE 7 and for which the component importance factor, I_p , is 1.5 according to ASCE 7 or listed as 1.5 in Section 017325.1.2.
- H. Inspection Body: Organization or individual accredited to ISO 17020 and regularly engaged in factory inspection services for seismic restraint of non-structural components and equipment.
- I. Special Inspector: An IAS accredited IBC special inspection agency or qualified professional engineer who demonstrates competence, to the satisfaction of the building official (or Authority Having Jurisdiction [AHJ]), for inspection of the designated seismic systems. The owner or the registered design professional in responsible charge acting as the owner's agent shall employ one or more special inspectors to provide periodic inspections during installation of designated seismic systems.

- J. AHJ: Authority Having Jurisdiction – The governmental agency or sub-agency that regulates the construction process. This may be a local building department, state agency, federal entity or other body or bodies having statutory authority.
- K. OSHPD: California Office of Statewide Health, Planning and Development.
- L. ICC-ES: International Code Council Evaluation Service.
- M. IAS: International Accreditation Service, Inc.
- N. CBC: California Building Code.
- O. VISCMA: Vibration Isolation and Seismic Control Manufacturers Association.
- P. ASCE: Minimum Design Loads for Buildings and Other Structures.

1.4 RELATED SECTIONS

- A. Coordinate and comply with the requirements of the following:
 - 1. Section 01 73 24 – Anchorage and Sleeving
 - 2. Section 05 45 00 – Metal Support Assemblies
 - 3. Section 05 50 00 – Metal Fabrications
 - 4. Section 09 22 16 – Non-Structural Metal Framing
 - 5. Section 09 51 00 – Acoustical Ceilings
 - 6. Section 21 05 48 – Vibration and Seismic Controls for Fire Suppression Piping and Equipment
 - 7. Section 22 05 48 – Vibration and Seismic Controls for Plumbing Piping and Equipment
 - 8. Section 23 05 48 – Vibration and Seismic Controls for HVAC
 - 9. Section 26 05 48 – Seismic Controls for Electrical Systems

1.5 APPLICABLE PUBLICATIONS

- A. The most recent edition of publications listed below (including amendments, addenda revisions, supplements and errata) form a part of this specification to the extent referenced unless otherwise noted. The publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
 - 1. 355.2 Qualification for Post-Installed Mechanical Anchors in Concrete and Commentary.
 - 2. 318 Appendix D Anchoring to Concrete.
- C. American Institute of Steel Construction (AISC): Load and Resistance Factor Design American Society of Civil Engineers Minimum Design Loads for Building and Other Structures.
- D. American Society for Testing and Materials (ASTM):
 - 1. A36/A36M Standard Specification for Carbon Structural Steel.
 - 2. A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. A307 Standard Specification for Carbon Steel Bolts and Studs; 600,000 PSI Tensile Strength.
 - 4. A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 5. A325M Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric).
 - 6. A490 Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
 - 7. A490M Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
 - 8. A500/A500m Standard Specification for Cold-Form Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 9. A501 Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 10. A615/A615M Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 11. A992/A992M Standard Specification for Steel for Structural Shapes for Use in Building Framing.

12. A996/A996M Standard Specification for Rail-Steel and Axel-Steel Deformed Bars for Concrete Reinforcement.
 13. E488-96 Standard Test Method for Strength of Anchors in Concrete and Masonry Elements.
 14. E580 Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- E. American National Standards Institute (ANSI) and Rack Manufacturers' Institute (RMI): Specification For The Design, Testing and Utilization of Industrial Steel Storage Racks (ANSI MH16.1).
- F. American Welding Society (AWS):
1. AWS D1.1 Structural Welding Steel
 2. AWS D1.3 Structural Welding Sheet Steel
- G. International Code Council Evaluation Service (ICC-ES): Index of Reports can be found at <http://www.icc-es.org/reports/index.cfm>
- H. National Fire Protection Association: Installation of Sprinkler Systems (NFPA-13)
- I. OSHPD Code Application Notice 2-1708A.5 – Certification of Equipment and Nonstructural Components
- J. American Society of Mechanical Engineers (ASME)
1. Standard B31 Standards for Pressure Piping.

1.6 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) latest adopted Edition by the jurisdiction where the Project is located and applicable local and/or statewide adopted amendments.
- B. Special Seismic Certification – Provide certification in accordance with CBC, Chapter 17 and ASCE 7 Chapter 13 requirements for designated seismic systems as indicated on the Responsibility Matrix.

1.7 PROJECT SEISMIC DESIGN CRITERIA

- A. Seismic Design Category – See General Structural Notes and Abbreviations Sheet **S001**.
- B. Seismic Design Force – Calculation of seismic design force shall be based on the requirements of Chapter 13 of ASCE 7 with the following seismic design parameters
1. See General Structural Notes and Abbreviations Sheet **S001** for building seismic design criteria and parameters.
 2. Component importance factor (I_p) = 1.0 or 1.5 as indicated in the Responsibility Matrix or as required by ASCE 7 Section 13.1.3.
 3. Component amplification factor (a_p) and component modification factor (R_p) shall be determined in accordance with ASCE 7 Tables 13.5-1 and 13.6-1
- C. Seismic Relative Displacement – Design shall accommodate seismic relative displacement of **<insert ratio (e.g. 0.02)>** times the story height in addition to thermal movement that may be present.
- Δ_{1-2} = inter-story drift between floors 1 and 2 = X.XX
 Δ_{2-3} = inter-story drift between floors 2 and 3 = X.XX
 Δ_{3-Roof} = inter-story drift between floors 2 and 3 = X.XX
- D. Seismic Separation between Independent Structures – Components crossing seismic separations shall be designed to accommodate relative seismic movement between structures. Locations of seismic separations are shown on the drawings. Use the following to determine the range of movement required at each floor. Components shall be independently anchored to each structure.
1. $D_{A1-B1} = XX"$ (i.e. $\pm xx"/2$)

2. $D_{A2-B2} = XX''$ (i.e. $\pm xx''/2$)
3. $D_{A3-B3} = XX''$ (i.e. $\pm xx''/2$)
4. $D_{ARoof-BRoof} = XX''$ (i.e. $\pm xx''/2$)

1.8 SUBMITTALS

- A. Shop Drawings: Submit seismic restraint shop drawings in accordance Section 01 33 23:
 1. Incorporate seismic restraint layouts, details, erection drawings, fastener details, anchorage details, materials and member sizes into the specific component shop drawings in accordance with the individual specification article. Where the individual specification article does not require the shop drawings to be submitted, provide standalone seismic restraint shop drawings.
 2. Seismic restraint shop drawings shall be prepared or their preparation shall be overseen by a Professional Engineer, licensed in the state where the Project is located and is experienced in designing seismic restraints for nonstructural components as required by the authority having jurisdiction.
 3. The use of proprietary restraint systems with a certificate of compliance verified and listed by an IAS accredited inspection body is acceptable.
- B. Calculations: Submit signed engineering calculations concurrently with shop drawings:
 1. Seismic restraint calculations shall be prepared and signed by a Professional Engineer, licensed in the state where the Project is located, indicating structural integrity of members, anchors, fasteners and connections to building structure in accordance with specified criteria and the applicable building codes.
- C. Special Seismic Certification of Mechanical and Electrical Equipment and Distribution Systems:
 1. Each manufacturer of designated seismic system components shall provide a certificate of compliance indicating that the component and its mounting system or anchorage have been tested and/or analyzed in accordance with ASCE 7 to withstand required seismic loads and maintain operability.

1.9 QUALITY ASSURANCE

- A. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings and other structural data.
- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services in the area of seismic restraint of nonstructural components and systems.
- B. Special Seismic Certification of Mechanical and Electrical Equipment and Distribution Systems:
 1. Each manufacturer of designated seismic system components shall provide a certificate of compliance indicating that the component and its mounting system or anchorage have been tested or analyzed in accordance with ASCE 7 to withstand required seismic loads and maintain operability. Depending on the contents or functionality of the designated seismic system as defined in ASCE 7, certification shall be provided by an actual test on a shake table with three-dimensional shock tests, an analytical method using dynamic characteristics and forces and/or experience data based upon nationally recognized procedures acceptable to the authority having jurisdiction. Certificate must be verified by an IAS accredited inspection body or other independent inspection entity acceptable to the Authority Having Jurisdiction. Components shall be labeled with an identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an accredited agency that indicates that the representative sample of the product or material and its testing have been evaluated and listed by an accredited inspection body agency.

2. If a particular component has no manufacturer available that has been evaluated and listed by an accredited inspection body agency, then qualification must be by analysis performed by a professional engineer registered in the jurisdiction where the Project is located. Professional engineer must be approved by the authority having jurisdiction and experienced in providing engineering services of the kind indicated. Analysis must include an evaluation of stress and deflection developed through the entire load path from the center of applied seismic load to the equipment anchorage. Analysis must consider dynamic characteristics and the response spectrum required by code.
3. Special Seismic Certification for distribution systems such as piping and ductwork shall include a stress analysis of the pipe/duct, supports, bracing and anchors. The stress analysis shall include gravity and seismic demands and shall include an analytical assessment of connections and consideration of movement of points of attachment. The effects of in-line devices, where present, shall be considered in the analysis. Conformance with NFPA 13 2010 will satisfy Special Seismic Certification requirements for fire protection piping.

C. Coordination:

1. Do not install seismic restraints until seismic restraint submittals have been reviewed and accepted by the entity/entities identified on the Responsibility Matrix.
2. Verify that multiple systems installed in the same vicinity can be installed without conflict.
3. Verify tolerances between installed items to confirm that unbraced components will not come into contact with restrained equipment or structural members during an earthquake. When contact is possible, provide seismic restraint or provide justification to the satisfaction of the registered design professional in responsible charge of the project that contact will not cause unacceptable damage to the components in contact, their supports, finishes or other elements that are contacted.

PART 2 - GENERAL

2.1 STEEL

- A. Structural steel: ASTM A36, A36M, A992.
- B. Structural tubing: ASTM A500, Grade B.
- C. Steel pipe: ASTM A53/A53M, Grade B.
- D. Bolts and nuts: ASTM, A307, A325, A325M, A490, A490M, ASTM A563.
- E. Lag bolts and screws: ASME B18.2.1 (ASME B18.2.3.8M), ASTM A563.
- F. Powder driven anchors: NES NER-272.
- G. Nails: ASTM F1667.

2.2 LIGHT GAGE NON-LOAD BEARING METAL FRAMING

- A. Metal studs: A653 Grade 33, ASTM A1011 Grade 33, ASTM A446 Grade A or D, or ASTM A570.
- B. Tie wires: ASTM A641/A641M.
- C. Screws for fastening to cold-formed metal framing: ANSI B18.6.4.

2.3 WELDING

- A. Welding filler metal: AWS A5.1.

2.4 POST-INSTALLED ANCHORS

- A. Expansion or sleeve anchors: Pre-qualified for use in seismic applications per ASTM E488.
- B. Adhesive anchors: Pre-qualified for use in seismic applications per ASTM E488.

2.5 SEISMIC RESTRAINT CABLES

- A. Prestretched galvanized carbon steel cable 7x19 strand core, ASCE-19, ASTM A-1023 1A, ASTM A-603 or stainless steel.

2.6 CHANNEL STRUT AND FITTINGS

- A. Strut: ASTM A 1011SS Gr 33 or ASTM A 653 Gr 33.
Fittings: ASTM A 575, A 576, A36 or A 635.

PART 3 - EXECUTION

3.1 CONSTRUCTION, GENERAL

- A. For items identified in the Responsibility Matrix furnish and install supports, braces, connections, hardware and anchoring devices to withstand code-required seismic forces and seismic deformations without shifting or overturning. For components with $I_p = 1.5$, in addition to providing code-required seismic forces and deformations, provide installations capable of providing post-earthquake functionality.
- B. Construct seismic restraints and anchorages that do not inhibit thermal expansion and contraction of distribution systems. Utilize ASME Standard B31 when utilizing common supports for both thermal and seismic loading.
- C. Maintain fire ratings of assemblies as specified elsewhere or on the drawings in addition to compliance with the criteria set forth below.

3.2 NONSTRUCTURAL EXTERIOR WALL COMPONENTS

- A. Nonstructural exterior wall framing
 - 1. Design framing to resist out-of-plane seismic design force, movement due to temperature changes and relative vertical movement between floors.
 - 2. Design framing to accommodate code-required inter-story drift without damage that compromises the exterior wall water, moisture and thermal barriers.
 - 3. Design framing with sufficient out-of-plane stiffness to prevent damage to cladding or veneer when subjected to code-required out-of-plane forces.
- B. Veneer
 - 1. Fasten veneer to substrate to accommodate out-of-plane seismic design force and deformation of supporting framing.
 - 2. Anchored veneer shall be detailed to prevent moisture penetration from weather that could corrode anchors.
- C. Nonstructural prefabricated panels
 - 1. Design prefabricated panels and connections capable of resisting in-plane and out-of-plane forces and story drift deformations in accordance with ASCE 7.
- D. Glazing
 - 1. Design glazing to resist out-of-plane seismic design force.
 - 2. Design glazing to accommodate relative displacement to resist fallout as set forth in ASCE 7 Section 13.5.9.1 and not less than 0.5 inch.
 - 3. Drift limit for glass components shall be determined in accordance with AAMA 501.6 or by engineering analysis.
 - 4. In lieu of calculations, compliance with design criteria may be established by testing in accordance with AAMA 501.4.

3.3 INTERIOR PARTITIONS

- A. Heavy partitions (masonry, glass block, etc.)
 - 1. Design wall and connections to resist out-of-plane seismic design force.

2. Provide connection detail between the building structure and heavy partition to accommodate seismic relative displacement between partition and structure.
3. Maintain fire rating at connections in rated construction.

B. Light partitions (metal stud or wood stud)

1. Design partitions to resist out-of-plane seismic design force. Design force shall be based on the weight of the partition framing, finishes, soffits, connected casework or equipment, and ceilings for which it provides bracing. Out-of-plane design force shall not be less than 5 psf.
2. Design partitions to accommodate inter-story drift.
3. Fasten veneer to partition framing to resist code required forces and deformation of studs.
4. Where partition does not extend to the structure, the partition height does not exceed 9 feet, the linear weight of the partition does not exceed the product of 10 pounds times the height in feet of the partition and the partition horizontal load does not exceed 5 psf, lateral bracing to the building structural is not required. For all other conditions, provide supplemental bracing or framing to resist out-of-plane seismic design force. Such bracing or framing shall be independent of splayed wire ceiling bracing. Design wall bracing or framing for compatibility with ceiling deflection requirements, fire ratings and architectural treatments.
5. Design support and bracing to resist seismic design force in any direction.
6. When attaching items to interior partition walls, install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.

3.4 CEILING

A. Suspended acoustic tile ceilings

1. Design and install ceiling in accordance with ASTM E580.
2. For Seismic Design Categories D, E and F, provide bracing at regular intervals to resist code design forces and limit vertical and lateral movement.
3. Suspended ceilings with areas less than or equal to 144 square feet and that are surrounded by walls or soffits that are laterally braced to the structure above are exempt from seismic design requirements.
4. Where ceilings are unbraced or splayed wire bracing is used to resist seismic forces and limit lateral deflections, provide 1 inch clearance around all penetrations through the ceiling sprinkler drops. If flexible sprinkler drops are used and have been certified to accommodate 1 inch of movement, the 1 inch clearance requirement may be waived.
5. Provide independent support of lighting fixtures, diffusers, cable trays, electrical conduit and other ceiling appurtenances.
6. The ceiling system weight for determining seismic forces shall be taken as not less than 4 psf.

B. Ceilings directly fastened to structural framing or furred with materials that are directly applied to structural framing

1. Fasten ceiling to framing to resist the vertical seismic design forces and the weight of the ceiling and all connected light fixtures, sprinklers, HVAC appurtenances.

3.5 PARAPETS, ROOF SCREEN WALLS, APPENDAGES, CANOPIES, MARQUEES, SIGNS, CHIMNEYS, AND STACKS

A. Exterior appendages

1. Design component and connections to resist out-of-plane seismic design force and code wind force.
2. Design and provide supplementary framing and/or backing as required to support and anchor to structural framing.
3. Provide details that do not compromise water, moisture and thermal barriers.

3.6 ACCESS FLOORS

- A. Design forces shall be based on the weight of the access floor system, 100 percent of the weight of all equipment fastened to the floor and 25 percent of the weight of all equipment supported by but not fastened to the floor.
- B. Design access flooring for overturning effects of equipment fastened to the access floor panels shall also be considered
- C. Design each individual pedestal such that the maximum concurrent axial load due to overturning effects shall not exceed the portion of the access floor system weight assigned to the pedestal under consideration.
- D. Provide restraint to resist seismic design force in any direction. Use components that have been tested in accordance with CISCA "Recommended Test Procedures for Access Floors."
- E. The use of adhesive-only anchorage of pedestals is prohibited in Seismic Design Categories D, E and F.
- F. Special Access Floor shall be designed in accordance with ASCE 7, Section 13.5.7.2.

3.7 STAIRWAYS

- A. Stairs (including treads, risers, landings and enclosures)
 - 1. Design components and connections to resist seismic design force Design stairs to accommodate inter-story drift. Acceptable means shall include isolating the stair from experiencing internal stresses due to inter-story drift or provide substantiating evidence to demonstrate that stair can accommodate inter-story drift.
 - 2. Design and provide supplementary framing as required to support and anchor to structural framing.
 - 3. Design components and connections to maintain fire rating when subjected to seismic design forces and deformations.

3.8 EQUIPMENT SUPPORT SYSTEMS

- A. Suspended architectural and medical equipment and systems
 - 1. Design support and bracing to resist seismic design force in any direction.
 - 2. Provide flexible connection between equipment and interconnected components (piping, med gas, electrical wiring, etc).
 - 3. As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an accredited inspection body is acceptable. Use of a certified product does not preclude the requirement for shop drawings.

3.9 FREESTANDING WALLS OR FENCES

- A. Freestanding walls and fences:
 - 1. Design wall/fence and foundation capable of resisting out-of-plane seismic design force and code wind forces including out-of-plane forces.

3.10 MECHANICAL AND PLUMBING COMPONENTS

- A. Floor and base-mounted mechanical equipment (boilers, furnaces, pumps, chillers, manufacturing, process machinery, etc.), vibration isolated equipment and associated system vibration and seismic controls for connections.
 - 1. Design equipment anchorage to resist seismic design force in any direction.
 - 2. Design vibration and seismic controls for equipment to include base and isolator requirements.
 - 3. Provide flexible connection between equipment and interconnected piping.
 - 4. Where equipment is mounted on vibration isolators and restraints, use isolators and restraints designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.

5. Provide supplemental steel or concrete base as required for mounting equipment on isolators. Where equipment is not designed to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator base plate anchorage.
6. Where concrete floor thickness is less than required for expansion anchor installation per ICC-ESR, install through bolt in lieu of expansion anchor. Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws or other mechanical fasteners, furnish and install supplemental framing or blocking to transfer loads to structural elements.

B. Suspended mechanical equipment

1. Design support and bracing to resist seismic design force in any direction.
2. Provide flexible connection between equipment and interconnected piping.
3. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.
As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an accredited inspection body is acceptable. Use of a certified product does not preclude the requirement for shop drawings.

C. Wall-mounted mechanical equipment

1. Design support and bracing to resist seismic design force in any direction.
2. Install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.

D. Piping

1. Provide seismic bracing for piping as required by Section 1.2.
2. Provide supports, braces and anchors to resist gravity and seismic design forces.
3. Design piping and piping risers to accommodate inter-story drift.
4. Provide flexible connections between floor-mounted equipment and suspended piping; between unbraced piping and restrained suspended items; as required for thermal movement; at building separations and seismic joints; and wherever relative differential movements could damage pipe in an earthquake.
5. Brace resiliently-supported pipe with cable bracing or alternate means designed to prevent transmission of vibrations and noise to structure.
6. Brace every run (5 feet or more in length) with two transverse and one longitudinal bracing locations. For pipes and connections constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections) provide transverse bracing at not more than 40 feet on center and longitudinal bracing at spacing not more than 80 feet on center. For pipes and their connections constructed of non-ductile materials (cast iron, no-hub pipe and plastic or non-UL listed grooved coupling pipe), provide transverse bracing at not more than 20 feet on center and longitudinal bracing at spacing not more than 40 feet on center. Alternatively, explicitly design piping and connections to resist gravity and seismic forces and seismic deformations.
7. Provide lateral restraint for risers at not more than 30 feet on center or as required for horizontal runs, whichever is less.
8. Where piping is explicitly exempt from seismic bracing requirements, provide flexible connections between piping and connected equipment, including in-line devices such as VAV boxes and reheat coils.
9. Where piping is explicitly exempt from seismic bracing requirements, install piping such that swinging of the pipes will not cause damaging impact with adjacent components, finishes or structural framing. This will be considered satisfied if there is horizontal clear distance of at least 2/3 the hanger length between subject components. If swinging of exempted piping can cause damaging contact with adjacent components, finishes or structural framing, add swing restraints as required to eliminate contact.
10. As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an accredited inspection body is acceptable. Use of a certified product does not preclude the requirement for shop drawings.

11. Re-use of existing hangers: Where pipes are being installed in existing facilities, the re-use of existing hangers at locations of seismic bracing will be judged on a case-by-case basis by the registered project design professional. Unless otherwise shown on the drawings, it shall be assumed that all hangers supporting new piping and located at a seismic brace will be installed new.

E. Ductwork

1. Provide seismic bracing for ducts with cross sectional area greater than 6 square feet (independent of the duct contents) and for ducts containing hazardous materials.
2. Provide supports, braces and anchors to resist gravity and seismic design forces.
3. Design ducts and duct risers to accommodate inter-story drift.
4. Provide independent support for in-line devices weighing more than 20 pounds. Provide independent support and bracing for all in-line devices weighing more than 75 pounds. Unbraced piping attached to braced in-line equipment shall be provided with adequate flexibility to accommodate differential displacements.
5. Appurtenances such as dampers, louvers and diffusers shall be positively attached to the ductwork with mechanical fasteners.
6. Duct supports shall be designed to resist not less than 150 percent of the weight of the duct. For seismic design categories D, E and F, ducts weighing over 10 plf shall not be hung using power driven fasteners.
7. As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an IAS accredited inspection body or otherwise accepted by the Authority Having Jurisdiction is acceptable. Use of a certified product does not preclude the requirement for shop drawings.

F. Tanks

1. Design tank anchorage to resist seismic design force.
2. Design tank legs or supporting structure to resist seismic design force.
3. Provide flexible connections between tank and interconnected piping.

G. Fire suppression equipment and piping

1. See requirements for suspended piping.
2. See requirements for floor-mounted and wall-mounted equipment.
3. Satisfy requirements of NFPA 13 and the force and displacement requirements of ASCE 7. All components shall be UL listed.
4. Provide end of line restraint as required by NFPA 13.

3.11 ELECTRICAL EQUIPMENT

A. Electrical equipment

1. Design equipment to resist seismic design force in any direction.
2. Batteries on racks shall be provided with acid resistant and corrosion resistant wrap-around restraints or shall be otherwise prevented from movement within battery rack. Racks shall be designed to resist seismic design force.
3. Electrical cabinet design shall comply with the applicable National Electrical Manufacturers Association (NEMA) standards.
4. Supports shall be designed to accommodate the seismic relative displacement between points of support.
5. Where equipment is mounted on vibration isolators and restraints, use isolators and restraints designed for amplified code forces and with demonstrated ability to resist required forces including gravity, operational and seismic forces.

B. Conduit, cable tray, bus duct, raceways, bundled cabling

1. Provide supports and anchoring so that, upon application of seismic forces and deformations, conduit/cable tray/bus duct/raceway/bundled cabling will not displace sufficiently to cause damage to wires, connections, adjacent or connecting equipment, building members or finishes.
2. Provide seismic bracing of conduit/cable tray/bus duct/raceway/bundled cabling to resist gravity and seismic design forces.

3. Provide gravity support for conduit/cable tray/bus duct/raceway/bundled cabling that is independent of suspended ceiling framing.
4. Design conduit/cable tray/bus duct/raceway/bundled cabling to accommodate inter-story drift.
5. As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an accredited inspection body is acceptable. Use of a certified product does not preclude the requirement for shop drawings.
6. Provide flexible connections wherever relative differential movement could damage conduit/cable tray/bus duct/raceway/bundled cabling in an earthquake.

C. Light fixtures

1. Design fixture connections to resist seismic design force.
2. For lights in suspended ceilings:
 - a. For lights weighing 56 pounds or less, provide positive mechanical connection between fixtures and ceiling framing to resist seismic design force and gravity load. Provide two (2) independent wires at diagonally opposite corners connected to structural framing. For lights weighing more than 56 pounds, provide independent support and bracing.
3. For lights in light framed ceilings and walls:
 - a. For lights weighing 56 pounds or less, provide positive mechanical connection between the fixture and the ceiling/wall framing capable of resisting required gravity and seismic demands. Provide ceiling and wall framing capable of delivering demands from the light fixture to the structure.
4. For pendant mounted fixtures:
 - a. Verify that fixture will not displace in such a manner as to hit adjacent lighting and/or architectural elements or other suspended items. Connection to the structure shall allow a 360 degree range of motion. If pendant fixture could come in contact another item when swinging in a 45 degree arc from vertical in any direction, provide bracing to limit movement and avoid interaction. Design load shall be 1.4 times the operating weight acting down with a simultaneous horizontal load of 1.4 times the operating weight.

D. Communication systems including alarm systems

1. See requirements for electrical equipment and conduit, cable tray, bus duct, raceways, bundled cabling.

3.12 TRANSPORTATION COMPONENTS

A. Elevator and escalators

1. Design for conformance with seismic requirements of ASME A17.1.
2. Design to resist seismic design force specified herein. The more stringent design force shall govern.
3. Elevator/escalator equipment and controller supports and attachments shall be designed to resist seismic design force.
4. Elevators travelling with a speed of 150 ft/min or greater shall be provided with a seismic switch in accordance with ASCE 7.
5. Provide retainer plate at the top and bottom of the car and counterweight.

3.13 STORAGE RACKS AND SHELVING

A. Light duty storage racks and shelving

1. Provide restraint to resist seismic design force in any direction.
2. Where restraint is provided by anchorage to a wall, verify that wall has adequate strength to resist anchor demands. Install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor directly to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.

B. Industrial storage racks

1. Design for conformance with latest version of Rack Manufacturers Institute (RMI) *Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks* and the seismic design requirements of ASCE 7. Where design criteria conflict, the more stringent shall apply.

3.14 TELEVISIONS, MONITORS

- A. Design support and bracing for wall-mounted and suspended televisions/monitors to resist seismic design force in any direction.
- B. Where restraint is provided by anchorage to a wall, verify that wall has adequate strength to resist anchor demands. Install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor directly to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.
- C. Use mounting brackets certified for resistance to seismic loads.

3.15 DESKTOP COMPUTERS

- A. Provide straps, high friction pads, snubbers or other mechanisms as required to resist seismic design forces.
- B. All connections shall be readily demountable and shall not damage computer housing.

3.16 COMPUTER AND COMMUNICATIONS RACKS, CABINETS AND BOARDS

- A. Design equipment anchorage to resist seismic design force in any direction
- B. Where cable tray is connected to the top of racks or cabinets, design seismic restraint to include the tributary weight of the cable tray and components.
- C. Interconnect adjacent cabinets to cause them to respond together when resisting lateral forces.
- D. Where equipment is supported on raised access flooring, provide bracing and anchorage to the supporting floor below.

3.17 KITCHEN EQUIPMENT

- A. Design equipment anchorage to resist seismic design force in any direction.
- B. Connections shall enable the equipment to be readily disengaged to enable the equipment to be relocated for cleaning.
- C. Provide flexible connections between connected piping and kitchen equipment. If kitchen equipment is restrained with removable "tethers," provide sufficient flexibility in connections to accommodate full range of movement associated with tether.

3.18 SHELF- AND COUNTER-MOUNTED CONTENTS

- A. Provide straps, mechanical barriers, high friction pads, snubbers or other mechanisms as required to resist seismic design forces.
- B. All connections shall be readily demountable and shall not damage or permanently alter contents.
- C. Restraints shall not prevent items from being added to or removed from shelf or counter.

3.19 FIELD QUALITY CONTROL

- A. Owner will engage qualified special inspectors in accordance with Section 014533.
 1. Qualifications: The minimum category of special inspector required to perform services outlined below are noted by qualifications in parentheses. The definitions of the categories of special inspector are included in Section 014533.
- B. Coordinate with independent testing and inspecting agency engaged by the Owner to perform field quality control inspection and testing.

1. Provide necessary scaffolding or temporary platforms required by testing agency in order to perform their work. Such scaffolding or platforms shall comply with safety regulations and shall be acceptable to testing agency.
- C. Testing agency shall provide a quality assurance plan as required by ASCE 7, Appendix 11A for installation of the following components and systems per IBC Chapter 17. Confirm the installation of the following complies with details indicated on the Contract Documents and approved shop drawings. A minimum of 3 special inspections shall be performed (pre-construction, mid-construction, and final inspection):
1. Architectural (Structural 1):
 - a. Visually inspect the erection, fastening and anchorage of exterior cladding, veneer and nonbearing walls installed greater than 30 feet in height above grade or a walking surface and/or exterior cladding or veneer weighing more than 5 psf.
 - b. Visually inspect the erection of glass in glazed curtain walls and glazed storefronts for glass installed greater than 30 feet in height above grade or a walking surface.
 - c. Visually inspect the erection, fastening and anchorage of interior veneer and nonbearing walls installed greater than 30 feet in height above grade or a walking surface, interior veneer weighing more than 5 psf and/or interior nonbearing walls weighing more than 15 psf.
 - d. Visually inspect the erection of glass in interior glazed partitions installed greater than 30 feet in height above grade or a walking surface.
 - e. Visually inspect the erection and anchorage of suspended ceiling systems. Verify member type and size, verify that bracing elements such as splayed wires and compression struts are installed as detailed; test anchorage to structure.
 - f. Visually inspect the installation and anchorage of steel storage racks greater or equal to 8 feet in height. Verify connections and anchorages of the racks to structure. Spot check the connection of horizontal beams to uprights verifying fastener tightness.
 - g. Visually inspect the installation and anchorage of access floors. Verify connections and anchorages of access floor framing to structure. Verify connection of access floor framing to support posts. Inspect and proof load test installation of post-installed anchors.
 2. Mechanical, Electrical and Plumbing (Structural 1):
 - a. Visually inspect installation and anchorage of heating, ventilating and air-conditioning (HVAC) ductwork containing hazardous materials or smoke control.
 - b. Visually inspect installation and anchorage of piping systems and mechanical units containing flammable, combustible or highly toxic materials.
 - c. Visually inspect anchorage of electrical equipment used for emergency or standby power systems.
 - d. Visually inspect anchorage of all other electrical equipment.
 - e. Visually inspect installation and anchorage of vibration-isolated systems and associated seismic restraints where indicated on the construction documents or submittals. All restraints require a nominal clearance of 0.25 inch or less between the equipment support frame and restraint.
- D. Special Seismic Certifications (Structural 1):
1. Verify that the label, anchorage or mounting conforms to the certificate of compliance for designated seismic systems defined in Section 017325.1.2 and 1.3.
- E. Post-Installed Anchorage Inspection and Testing (Technician II):
1. Refer to individual specification sections and/or structural drawings identified in Section 014533 for special inspection and proof load testing of post-installed anchors.
- F. Correct deficiencies in work which inspections and test reports have indicated to be not in compliance with requirements when directed in writing by Architect or Owner.

END OF SECTION

**SECTION 01740
CLEANING**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Construction Cleaning.
- B. Requirements for cleaning during progress of Work, at Substantial Completion of Work and at Acceptance of Work.
- C. Disposal of waste materials, debris and rubbish during construction.

1.02 RELATED SECTIONS

- A. General Conditions of the Contract: Cleanup.
- B. Additional Requirements: Cleaning for specific products or elements of Work are described in Specification Sections describing that Work.
- C. Section 01561 Airborne Contaminants Control have procedures and practices that shall be implemented and followed by the Contractor for this project.

PART II - PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning agents and materials that will not create hazards to health or property and that will not damage surfaces.
- B. Use only those cleaning agents, materials and methods recommended by manufacturer of the material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning agent manufacturer.

2.02 EQUIPMENT

- A. Provide covered containers for deposit of waste materials, debris, and rubbish.
- B. Provide at each entry point to the Work, and at other areas as directed by University's Representative, a clean room sticky mat. Replace mats daily or as requested by University Representative.

PART III - EXECUTION

3.01 CLEANING

- A. Construction Cleaning: During Construction, maintain buildings, premises and property free from waste materials and rubbish. Dispose of such waste and debris at reasonable intervals off of University property.

1. Maintain areas under Contractor's control free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.
 2. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to closing such spaces.
 3. Clean interior areas daily to provide suitable conditions for Work. Remove debris from areas of work on a daily basis at a minimum, or more often as required to provide suitable conditions for work.
 4. Broom clean with sweeping compound or HEPA Vacuum interior areas prior to start of surface finishing, and continue cleaning on as needed basis.
 5. Control cleaning operations so that dust and other particles will not adhere to wet or newly-coated surfaces.
 6. Provide a mat, as specified above, for project entrances and exits. Item to be of sufficient size to allow personnel exiting project site to clean debris and dust from shoes. Tracking dust and debris through working areas of hospital and/or related buildings is not acceptable. Any dust or debris tracked out of construction site, either by foot traffic or by debris hauling vehicles, at University option, shall be cleaned and removed by Contractor at no additional cost to the University.
- B. Conduct cleaning and disposal operations in compliance with all applicable codes, ordinances, regulations, including anti-pollution laws.

3.02 SUBSTANTIAL COMPLETION CLEANING

- A. Execute a thorough cleaning prior to Substantial Completion review by University's Representative.
- B. Clean walkways, driveways and streets by thorough brooming and wash-down.
- C. Clear debris from storm drainage lines and ways, leaving site ready for stormy weather.
- D. Rake landscaped areas clean.
- E. Remove waste and surplus materials, rubbish and temporary construction facilities, utilities and controls.
- F. Disinfect containment and protection areas as directed by University Representative.
- G. For Airborne Contamination areas: Construction cleaning use wet cleaning methods and HEPA-filtered vacuum cleaners are required to minimize release of airborne contaminants. Contain waste materials, debris and rubbish.

3.03 FINAL COMPLETION CLEANING

- A. Complete final cleaning before submitting final Application for Payment.
- B. Employ professional building cleaners to thoroughly clean building immediately prior to final inspection.

- C. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from all sight-exposed interior and exterior surfaces.
- D. Restore damaged or marred surfaces.
- E. Remove dust from all horizontal surfaces not exposed to view, including light fixtures, ledges and fixture lenses.
- F. Clean and polish all glass, mirrors, and bright metal work. Clean and disinfect all plumbing fixtures.
- G. Damp wash all resilient flooring. Waxing of resilient flooring shall be done by the University.
- H. Thoroughly sweep all floors and vacuum all carpets. Cleaning of Work provided by University under separate contracts, will not be required except if soiled by construction activities under this Contract.
- I. Thoroughly clean and polish all resilient flooring, metal and plastic surfaces; remove labels and protective coatings.
- J. Replace filters and clean heating and ventilating equipment used for temporary heat and ventilation.
- K. Remove waste material or equipment that has been damaged, touch up and /or repair exposed areas; such repairs to be approved by University's Representative.
- L. Should final cleaning be inadequate, as determined by University's Representative, and Contractor fails to correct conditions, University's Representative may order thorough cleaning and deduct the cost from Final Payment.

3.04 FINAL COMPLETION SITE CLEANING

- A. Broom clean exterior paved surfaces. Rake clean other surfaces of the grounds.
- B. Hose down and scrub where necessary all concrete and walks dirtied as a result of the construction work. Thoroughly remove mortar droppings from all walks and pavements.
- C. Remove from the site all tools, equipment, construction waste, unused materials, excess earth, and all debris resulting from the Work.

3.05 DISPOSAL

- A. Conduct cleaning and disposal operations in compliance with all applicable codes, ordinances, regulations, including anti-pollution laws.
- B. Do not bury or burn rubbish or waste material on University premises.
- C. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
- D. Remove waste materials, debris, and rubbish from site and dispose of off-site.

3.06 INSPECTION

- A. Prior to final completion or University use of premises, Contractor and University's Representative shall jointly conduct an inspection of sight-exposed interior and exterior surfaces to verify that entire Work is clean.

END OF SECTION 01740

**SECTION 01750
STARTING AND ADJUSTING SYSTEMS**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for Starting Systems

1.02 RELATED SECTIONS

- A. Section 01810 – PLUMBING/HVAC TESTING PROCEDURES
- B. Section 01820 – DEMONSTRATION AND TRAINING

1.03 SUBMITTAL REQUIREMENTS

- A. Submit preliminary schedule listing times and dates for start-up of each item of equipment in sequence in writing, minimum of fourteen (14) calendar days prior to any start-up.
- B. Submit manufacturer's representative reports within one (1) week after start-up, listing satisfactory start-up dates.

1.04 PROJECT CONDITIONS

- A. Building enclosure shall be complete and weather-tight.
- B. Excess packing and shipping bolts shall be removed.
- C. Interdependent systems shall have been checked and made operational.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 INSPECTION

- A. Verify Project conditions comply with requirements for start-up.
- B. Verify status of Work meets requirements for starting equipment and systems.

3.02 PREPARATION

- A. Coordination: Coordinate sequence for start-up of various item of equipment.
- B. Notification: Notify University in writing, minimum of fourteen (14) calendar days prior to start-up of each item of equipment.
- C. Information on hand: Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during entire start-up process.
- D. Verify each piece of equipment has been checked for proper lubrication, drive rotation, belt tension, control sequence, and other conditions that may cause damage.

- E. Verify control systems are fully operational in automatic mode.
- F. Manufacturer's Criteria: Verify tests, meter readings and specific electrical characteristics agree with electrical equipment manufacturers' criteria.
- G. Bearings: Inspect for cleanliness: clean and remove foreign matter, verify alignment. Take corrective action as required.
- H. Drives: Inspect for tension on belt drives, adjustment of vari-pitch sheaves and drives, alignment, proper equipment speed, and cleanliness. Take corrective action as required.
- I. Motors: Verify motor amperage agrees with nameplate value. Inspect for conditions that produce excessive current flow and that exist due to equipment malfunction. Take corrective action as required.

3.03 STARTING SYSTEMS

- A. Execute start-up under supervision of responsible Contractor personnel.
- B. Place equipment in operation in proper sequence in accordance with sequencing schedule.

END OF SECTION 01750

SECTION 01760
PROTECTING INSTALLED CONSTRUCTION

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Protection for Products Including University Provided Products, After Installation.
- B. Protection of Existing Utilities and Interference.

1.02 RELATED SECTIONS

- A. Section 01310 – COORDINATION
- B. Section 01510 – TEMPORARY UTILITIES

1.03 EXISTING UTILITIES

- A. Known Utilities: Known existing utilities are shown on Contract Drawings in approximate locations. Contractor shall exercise care in avoiding damage to existing facilities. Contractor shall be responsible for repair of same if damaged through Contractor's action. Hand excavation shall be utilized when digging in close proximity to existing utilities. University does not guarantee that all utilities or obstructions are shown, or that locations indicated are accurate.
- B. Electrical Equipment: No work shall be performed on energized electrical equipment unless scheduled with University's Representative. University reserves right to specify specific conditions for all work involving energized high voltage electrical equipment and its scheduled modification proposal.
- C. Uncovering Facilities: Prior to any earthwork for new construction, Contractor shall uncover all existing piping where crossings, interferences or connections are shown on Contract Drawings, from one (1) foot below proposed construction limit to the existing ground surface. Any variation in actual elevations and indicated elevations shall be brought to University's Representative attention. If Contractor does not expose all existing utilities, Contractor shall not be entitled to additional compensation for work necessary to avoid unknown interferences.
- D. Interferences: If interferences occur at locations other than general locations shown on Contract Drawings, and such utilities are damaged before such locations have been established, or create an interference, Contractor shall immediately notify University's Representative and a method for correcting said interference shall be supplied by University. Payment for additional work due to interferences not shown on Contract Drawings shall be in accordance with the General Conditions of the Contract. Cost of repair to damaged utilities shall be deducted from the Contract Sum.
- E. Accuracy of Drawings: Drawings showing location of equipment, piping, etc. are diagrammatic and job conditions will not always permit installations in locations shown. When a conflict situation occurs, immediately bring to attention of University's Representative for determination of relocation.

- F. Deviations from Drawings: Information shown relative to existing power and signal service is based upon available records and data but shall be regarded as approximate only. Minor deviations found necessary to conform with actual locations and conditions shall be made at no change to the Contract Sum.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 PROTECTION AFTER INSTALLATION

- A. Installed Equipment and Materials: Adequately protect all installed equipment and materials until completion and acceptance by University's Representative.
- B. Existing Facilities: All existing improvements and facilities shall be protected from damage of any type resulting from operations, equipment or workers of Contractor during the construction process.
- C. Subsequent Operations: Protect installed products and control traffic in immediate area to prevent damage from subsequent operations.
- D. Traffic Areas: Provide protective coverings at walls, projections, corners, and jambs, sills, and soffits of openings in and adjacent to traffic areas.
- E. Elevators: Cover walls and floors of elevator cabs, and jambs of cab doors, when elevators are used by construction personnel.
- F. Finished Floors: Protect finished floors and stairs from dirt, wear, and damage:
 - 1. Secure heavy sheet goods or similar protective materials in place, in areas subject to foot traffic.
 - 2. Lay planking or similar rigid materials in place in areas subject to movement of heavy objects and where storage of products will occur.
- G. Waterproofed and Roofed Surfaces:
 - 1. Restrict use of surfaces for traffic of any kind, and for storage of products.
 - 2. When an activity is mandatory, obtain recommendations for protection of surfaces from manufacturer. Install protection and remove on completion of activity. Restrict use of adjacent unprotected areas.
- H. Lawns and Landscaping: Restrict traffic of any kind across planted lawn and landscaped areas.
- I. Adjacent Facilities: Care shall be exercised to prevent damage to adjacent facilities including walks, curbs, and gutters. Planking shall be placed where equipment will pass over such obstructions, and facilities damaged by construction operations shall be removed and replaced at Contractor's expense.

- J. Overloading: Contractor shall be responsible for overloading any part or parts of structures beyond the calculated capacities of the design. Placing materials, equipment, tools, machinery or any other item shall be done with care to avoid overloading. No loads shall be placed on floors or roofs before they have attained their permanent and safe strength.

- K. Damaged Work: All damaged work shall be replaced, repaired and restored to its original condition without change to the Contract Sum. Repair or replace all damaged work promptly as directed by University's Representative.

- L. Damaged Utilities: Where existing utilities are damaged or disrupted on account of any act, omission, neglect or misconduct of the Contractor in the manner or method of executing the Work, or due to non-execution of work, such damage shall be immediately repaired to maintain operation regardless of the time of occurrence.

- M. Temporary Construction: Provide temporary construction necessary for protection of building and its parts. Close in buildings as soon as possible to protect from weather and vandalism. Protect existing buildings and controlled temperature areas from damage.

- N. Doors and Casework: Protect doors, millwork and mill counters and cases and hardware from damage, including abrading and scratching of finishes. Protect doors and frames and hardware from mechanical damage and damage to anodic coatings.

- O. Protective Coatings: Remove protective coatings, etc., as required to leave work in condition for painting and finishing, final cleaning, etc.

- P. Exterior Work: Protect all exterior work, including existing asphalt paving and landscaping and buildings.

END OF SECTION 01760

**SECTION 01770
CLOSEOUT PROCEDURES**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Project Closeout Procedures
- B. Contract Closeout Procedures

1.02 RELATED SECTIONS

- A. Section 01310 – COORDINATION
- B. Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES: Administrative general requirements for submittals.
- C. Section 01560 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS: Removal of Controls.
- D. Section 01740 – CLEANING: Final Cleaning.
- E. Section 01780 – CLOSEOUT SUBMITTALS

1.03 FINAL COMPLETION ACTIONS

- A. On Application for Payment that coincides with date Substantial Completion is claimed, show 100% completion for portion of Work claimed substantially complete.
- B. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- C. Change building locks from construction to permanent keying, as directed by University's Representative.
- D. Complete start-up testing of systems, and instruction of University personnel. Remove temporary facilities from site, along with construction tools, mock-ups, and similar elements.

1.04 SUBSTANTIAL COMPLETION REVIEW

- A. Preliminary Punch List Review: At Contractor's request, University's Representative will attend preliminary contract closeout review, not later than fourteen (14) calendar days prior to anticipated Substantial Completion review date.
 - 1. Contractor shall provide at preliminary review a typewritten list (Preliminary Punch List) of items to be completed and corrected.
 - 2. List shall identify items by location (e.g., room number and name) and consecutive number (e.g., 307-5 might identify item 5 in room 307, Roof-4 would identify item 4 on Roof).
 - 3. Segregate architectural, plumbing, HVAC and electrical Work on separate lists.

4. University's Representative and Contractor shall conduct a brief walk-through of Project to review scope and adequacy of list.
- B. Contractor's Certification: When determined by Contractor that Work is substantially complete, Contractor shall notify University's Consultant and University's Representative.
1. Submit to University's Representative written certification that:
 - a. Contract Documents have been reviewed.
 - b. All portions of Work have been carefully inspected.
 - c. Work is complete in accordance with Contract Documents.
 - d. Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - e. Operation of systems has been demonstrated to University personnel.
 - f. Work is ready for University's Consultant's Substantial Completion review.
 2. Provide minimum seven (7) working days notice to University's Representative prior to desired date for Punch List review.
- C. Punch List Review: University's Representative and University's Consultants as may be required, will attend a Contract closeout review and conduct a walk-through of Project to review Contractor's list of items to be completed and corrected (Punch List). Contractor and University's Consultant shall note deficiencies, if any.
1. Contractor shall prepare list and record additional items as University's Representative may determine require completion and correction from walk-through.
 - a. If deficiencies are noted University's Representative and University's Consultant shall promptly notify Contractor in writing, listing observed deficiencies.
 - b. If no deficiencies are noted, or when noted deficiencies are removed from the Punch List, University's Representative shall promptly notify Contractor.
 2. Contractor shall re-type and distribute list with University's Representative and University's Consultant's additions.
 3. Contractor shall remedy deficiencies.
 4. Costs of additional visits to site by University's Consultants to review completion and correction of Work shall be deducted from the Contract Sum.
- D. Uncorrected Work: Refer to requirements specified in SECTION 01450 – QUALITY CONTROL regarding Contract adjustments for non-conforming work.

- E. Cleaning and Clearing: Prior to Substantial Completion review, execute cleaning and clearing site of temporary facilities and controls, as specified in SECTION 01560 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS.
- F. Testing and Inspection: Prior to Substantial Completion review, complete all tests and inspections and submit applicable reports and approvals.
 - 1. Complete materials tests and inspections.
 - 2. Complete testing, inspection, balancing, sterilization and cleaning of plumbing and HVAC systems.
 - 3. Complete testing and inspection of electrical system.
 - 4. Complete operational tests of equipment.
- G. Consultant's Certification: University's Consultant will complete and issue notice of Substantial Completion on American Institute of Architect's Form G704 – CERTIFICATE OF SUBSTANTIAL COMPLETION.
 - 1. Certificate will be completed when University's Consultant determines that list of items to be completed and corrected (Punch List) are sufficiently complete for University to occupy Project for the use intended.
 - 2. University's Consultant will forward copies of completion certification to University and Contractor.
 - 3. IF OSHPD PROJECT: Submit two (2) originals of Contractor's Final OSHPD Verified Reports to University's Representative certifying completion of the Work in conformance with the Contract Documents. Report forms will be supplied by University's Representative.
- H. Acceptance of the Work shall not relieve Contractor of any responsibility for defects that develop during the guarantee period and are caused by Contractor's failure to perform work in accordance with requirements of Contract Documents.

1.05 FINAL COMPLETION SUBMITTALS

- A. Evidence of Compliance with Requirements of Governing Authorities:
 - 1. Certificate of Occupancy.
 - 2. Compliance Notification: In conformance with State of California Energy Conservation Standards, Contractor shall, at time of request for final inspection, issue to University's Representative notarized certificate stating completed work appears, in every material respect, to be in compliance with approved Contract Documents. Provide only if specifically required.
- B. Final Specifications Submittals: Submit to University's Consultant all documents and products required by Specifications to be submitted, including the Following:
 - 1. Project Record Drawings: Submit under provision of SECTION 01780 – CLOSEOUT SUBMITTALS.

2. Operation and Maintenance Data: Submit under provision of SECTION 01780 – CLOSEOUT SUBMITTALS.
 3. Guarantees, Warranties, Bonds, Service and Maintenance Contracts: Submit under provision of SECTION 01780 – CLOSEOUT SUBMITTALS.
 4. Spare Parts and Maintenance Materials: Submit under provision of SECTION 01780 – CLOSEOUT SUBMITTALS.
 5. Keys and Keying Schedule: At completion of Project, all keys shall be returned to University's Representative. Failure to return a key will obligate Contractor for all costs of re-keying facility.
- C. Certificates of Compliance and test Report Submittals: Submit to University's Representative certificates and reports as specified and required, including the following:
1. Sterilization of water system
 2. Sanitary sewer system tests
 3. Gas system tests
 4. Lighting, power and signal system tests
 5. HVAC equipment and air balance tests
- D. Lien and Bonding Company Releases: Submit to University's Representative, copies of all conditional and unconditional general/subcontractor lien releases showing satisfaction of encumbrances and release of liens of Project by completion and submission of Exhibits of the General Conditions of the Contract, as applicable. Signatures shall be notarized.
- E. Subcontractor's List: Submit to University's Representative five (5) copies of updated Subcontractor and Materials Supplier List.
- F. Warranty Documents: Prepare and submit to University's Representative all warranties and bonds as specified in SECTION 01780 – CLOSEOUT SUBMITTALS.

1.06 STATEMENT OF ADJUSTMENT OF ACCOUNTS

- A. Submit final statement reflecting adjustments to Contract Sum indicating:
1. Original Contract Sum
 2. Previous Change Orders
 3. Changes under allowances
 4. Changes under unit prices
 5. Deductions for uncorrected work
 6. Penalties
 7. Deductions for liquidated damages

8. Deductions for re-inspection fees
 9. Other adjustments to Contract Sum
 10. Total Contract Sum as adjusted
 11. Previous payments
 12. Sum remaining due
- B. University will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Order.

1.07 APPLICATION FOR FINAL PAYMENT

- A. Final Payment: After completion of all items listed for completion and correction, after submission of all documents and products, and after final cleaning, submit final Application for Payment, identifying total adjusted Contract Sum, previous payments and sum remaining due. Refer to SECTION 01290 – MEASUREMENT AND PAYMENT and the General Conditions of the Contract.
- B. Submit Record Documents to University's Representative with final Application for Payment.

1.08 PROJECT AS-BUILT DOCUMENTS

- A. Maintain on site, one (1) set of the following as-built documents and record actual construction and all revisions to the Work:
1. Contract Drawings
 2. Contract, with Specifications, Addenda, Change Orders, and modifications to the Contract.
 3. Approved shop drawings, product data and samples.
 4. Store As-built Documents separate from documents used for construction.
- B. Drawings: Record information continuously as Work progresses. Do not conceal Work permanently until required information is recorded.
- C. Specifications: In PART 2 – PRODUCTS in each Section, legibly mark and record actual Products installed or used, including:
1. Manufacturer, trade name, product model or catalog number and supplier of each product or item of equipment installed.
 2. Product substitutions or alterations utilized.
 3. Changes made by Addenda, Modification, Change Order, Field Order, and clarifications or interpretations made by Letter of Instruction.

- D. As-built Drawings: Keep up to date during entire progress of the Work and make available to University at any time. Recording of the As-built condition shall be carefully and neatly done by a competent drafter, familiar with the trade involved, using methods acceptable to University's Representative. Legibly and to scale, mark a reproducible set of Contract Drawings to record all changes in size, location, and other features of installation in the actual construction, including:
1. Measured depths of foundations and footings encountered, measured in relationship to finish First Floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent ground improvements.
 - a. Locations of work buried under or outside building footprint, such as plumbing and electrical lines and conduits.
 - b. Record all locations of underground work, points of connection, valve locations, manholes, catch basins, capped stub-outs, invert elevations, etc.
 3. Field changes of dimension and detail.
 - a. Locations of all significant work concealed inside building, the locations of which are changed by Contractor from those shown on Contract Drawings.
 - b. Locations of all items, not necessarily concealed, which vary from locations shown on the Contract Drawings.
 - c. Record sufficient information so that concealed work may be located with reasonable ease and accuracy.
 4. Actual numbering of each electrical circuit.
 5. Details not on original Contract Drawings.
 6. Additional drawings as required to properly describe changes.
 7. Reproducible set of Contract Drawings will be provided to Contractor by University's Representative.
- E. Shop Drawings: Provide reproducible Record copy, made from final Shop Drawings, updated to show actual conditions for work specified in individual Sections.
- F. Large Scale Drawings: Divisions 15 and 16 of the Contract Specifications require preparation of large-scale, detailed layout drawings for the work of those Divisions. These layout drawings are not shop drawings as defined by the General Conditions of the Contract but together with Shop Drawings or layout drawings of all other affected sections, are used to check, coordinate and integrate the Work of the Various Sections. Maintain and submit these layout drawings as part of the Project Record Drawings.
- G. Acceptance: All Record Documents are subject to review and acceptance by University.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01770

**SECTION 01780
CLOSEOUT SUBMITTALS**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Equipment Data
- B. Operation and Maintenance Instructions
- C. Instruction of UCDMC personnel
- D. Schedule of Submittals
- E. Spare Parts and Maintenance Materials
- F. Guarantees, Warranties, Bonds, Service and Maintenance Contracts
- G. Project As-built Documents

1.02 RELATED SECTIONS

- A. Section 01310 – COORDINATION
- B. Section 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- C. Administrative general requirements for submittals.
- D. Section 01450 – QUALITY CONTROL: Manufacturer's tests and inspections as a condition of warranty.
- E. Section 01610 – PRODUCT REQUIREMENTS
- F. Section 01770 – CLOSEOUT PROCEDURES

1.03 EQUIPMENT DATA AND OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Preparation of data shall be done by persons:
 - 1. Trained and experienced in maintenance and operation of described products.
 - 2. Familiar with requirements of this Section.
 - 3. Skilled in technical writing to extent required for communication of essential data.
 - 4. Skilled as drafters competent to prepare required drawings
- B. Equipment Manual Format: Prepare in the form of a data and instructional manual.

1. Binders: Commercial quality, 8-½" x 11", three-ring binders with hardback, cleanable, plastic covers; 1" minimum, 1-½" maximum ring size. Provide separate binders, submitted separately for each discipline, i.e. Site Work, Doors and Windows, Conveying Systems, Mechanical, Plumbing, Electrical, etc. Correlate data into related consistent groupings. Provide two (2) copies of data in Adobe PDF format on CD as well.
 2. Cover: Identify each binder with typed or printed title "EQUIPMENT DATA AND OPERATION AND MAINTENANCE INSTRUCTIONS".
 - a. List Project title and Project number and particular building as applicable.
 - b. Identify contents.
 3. Organization: Arrange content by systems under Section numbers and sequence in accordance with the Project Specifications Table of Contents. Provide tabbed flyleaf for each separate product and system with typed description of product and major component parts of equipment.
 4. Text: Manufacturer's printed data or typewritten data on 20 pound paper.
 5. Drawings: Provide with reinforced punched binder tabs. Bind in with text; fold larger drawings to size of text page. Do not hole punch drawings. Insert drawings in clear plastic holder.
- C. Table of Contents, Each Volume: Provide title of Project, Project number, with names, addresses, and telephone numbers of University's Representative, as applicable, and Contractor, including name of contact person. Provide schedule of products and systems, indexed to content of the volume.
1. For each Product or System: List names addresses and telephone numbers of subcontractor, original supplier and manufacturer, as applicable, including name of contact person. Include name and address of local source of supplies and replacement parts.
 2. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete information not applicable.
 3. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
 4. Additional Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in SECTION 01450 – QUALITY CONTROL.
 5. Warranties and Bonds: Bind in copy of each.
- D. Manual for Materials and Finishes:
1. Building Products, applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured Products.

2. Instruction for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
3. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
4. Additional Requirements: As specified in individual Specification Sections.
5. Table of Contents: Provide a listing in Table of Contents for design data, with tabbed binder divider page and space for insertion of data.

E. Manual For Equipment And Systems

1. Record Instructions: Forward to University's Representative, upon completion of work, and before work will be considered for acceptance, complete bound sets of instructions of entire plant and component parts, including manufacturer's certificates, warranty slips, parts lists, descriptive brochures, and maintenance and operating instructions, in quantities set forth in various Divisions. Print information on heavy white paper, tab properly and identify for each reference. Submit drafts for review before preparing final sets, six (6) copies required.
2. O & M Instructions: Provide and install, where directed, printed sheet under clear plastic cover, giving concise operating and maintenance instruction for equipment.
3. Each Item of Equipment and Each System: Inclusive description of unit or system, Model Number, Serial Number, and component parts. Identify function, normal characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts. Best to include all information provided in final approved equipment submittal. Design drawing data may not reflect what was actually provided.
4. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.
5. Wiring Diagrams: Include color-coded wiring diagrams as installed.
6. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
7. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and re-assembly instructions; and alignment, adjusting, balancing, and checking instructions. Provide servicing and lubrication schedules, and list of lubricants required.
8. Instructions: Include manufacturer's printed operation and maintenance instructions. Include sequence of operation by controls manufacturer.

9. Parts Data: Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 10. Control Data: Provide as installed control diagrams by controls manufacturer.
 11. Piping Data: Provide Contractor's coordination drawings, with color piping diagrams as installed. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 12. Design Data: Provide a listing in table of Contents for design data, with tabbed binder divider page and space for insertion of data.
 13. Reports: Include test and balancing reports as specified in SECTION 01810 – TESTING, ADJUSTING AND BALANCING PROCEDURES.
 14. Additional Requirements: As specified in individual Specification Sections.
- F. Instruction of University's Personnel: Instruct University designated personnel to their full and complete understanding, procedures necessary to operate and maintain equipment and systems on continuing basis. Provide training of staff.
1. Schedule: Before final inspection, instruct University designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times. For equipment requiring seasonal operation, perform instructions for other seasons within six (6) months of completion.
 2. Basis of Information: Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
 3. Instructional Material: Prepare and insert additional data in the manual when need for such data becomes apparent during instruction.
- G. Equipment Data and Operation and Maintenance Instructions Submittals:
1. Submittals: Comply with administrative requirements specified in SECTION 01330 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
 2. Preliminary Draft Submittal: Submit two (2) copies of preliminary draft or proposed formats and outlines of contents no later than ten (10) days of equipment submittals approval. University's Representative will review draft and return one (1) copy with comments.
 3. Advance Submittals: For equipment, or component parts of equipment to be put into service during construction and operated by University, submit documents within ten (10) calendar days after equipment approval.

4. Final Submittal: After completion of instruction of University operation and maintenance personnel and final inspection, revise content of documents to include additional information deemed necessary from instruction experience of University's personnel and any changes made during construction. Submit three (3) copies of completed volumes in final form a minimum of ten (10) calendar days after final inspection.

1.04 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Products Required: Where called for in Contract Specifications, deliver to University's Representative, materials, etc., for use in maintenance work. Provide list of materials delivered to University's Representative, indicating date and acceptance by University's Representative.
 1. Provide quantities of products, spare parts, maintenance tools, and maintenance materials specified in individual Sections to be provided to University's Representative, in addition to that required for completion of the Work.
 2. Products supplied shall be identical to those installed in the Work. Include quantities in original purchase from supplier to avoid variations in manufacture.
- B. Storage, maintenance: Store products with products to be installed in the Work, as specified in SECTION 01610 – PRODUCT REQUIREMENTS: Product Storage and Protection.
- C. Delivery to site: Prior to final payment, deliver and unload spare products to project site. Coordinate with University's Representative and obtain receipt. University will handle and store products.

1.05 WARRANTIES AND GUARANTEES

- A. Warranties and Guarantees, general: Guarantees from subcontractors shall not limit Contractor's warranties and guarantees. Whenever possible, Contractor shall cause warranties of subcontractors to be made directly to University. If such warranties are made to Contractor, Contractor shall assign such warranties to University prior to final payment. When equipment and products, or components thereof, bear a manufacturer's warranty or guarantee that extends the time period of Contractor's warranty or guarantee, so state in the warranty or guarantee.
 1. Standard Product Warranties: Preprinted written warranties published by individual manufacturers for particular products and specifically endorsed by manufacturer to University.
 2. Special Warranties: Written warranties required by or incorporated in Contract Documents, to extend time limits provided by standard warranties or to provide greater rights for University.
 3. Provisions for Special Warranties: Refer to General Conditions of the Contract for terms of Contractor's special warranty of workmanship and materials.
 4. Specific Warranty Requirements: requirements are included in the individual Sections of Division 2 through 16 of the Contract Specifications, including content and limitations

5. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of warranty on work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors requirement to countersign special warranties with Contractor.
 6. 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.
 7. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to original warranty with an equitable adjustment for depreciation.
 8. Replacement Cost: On determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. Contractor shall be responsible for cost of replacing or rebuilding defective work regardless of whether University has benefited from use of the work through part of its useful service life.
 9. UCDCMC Recourse: Written warranties made to University are in addition to implied warranties, and shall not limit duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which University can enforce such other duties, obligations, rights, or remedies.
 10. Rejection of Warranties: University reserves right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
 11. University reserves right to refuse to accept work where a special warranty, or similar commitment is required, until evidence is presented that entities required to countersign commitments are willing to do so.
 12. When designated portion of Work is completed and occupied or used by separate agreement with Contractor during the construction period, submit properly executed warranties to University's Representative within fourteen (14) calendar days of completion of that designated portion of the Work.
 13. Submit written guarantees, in the form contained at end of this Section.
- B. Form of Warranty or Guarantee: All written warranties and guarantees, excepting manufacturers' standard printed warranties and guarantees, shall be submitted on Contractor's, subcontractor's, material supplier's, or manufacturer's own letterhead, addressed to University. Warranties and guarantees shall be submitted in duplicate, and complying with the form letter following. Warranty and guarantee letters shall be signed by all responsible parties and by Contractor in every case, with modifications only as approved by University to suit the conditions pertaining to the warranty or guarantee.
- C. Submission requirements:
1. Contractor shall collect and assemble required warranties, guarantees, bonds, and service and maintenance contracts. Provide two (2) original signed copies of each.

2. Table of Contents: Neatly typed and in orderly sequence, provide complete information for each items as follows:
 - a. Product or Work item.
 - b. Product or work suppliers firm name, address, telephone number and name of principal.
 - c. Scope of guarantee, bond, service or maintenance agreement.
 - d. Date of beginning of guarantee, bond, service or maintenance contract.
 - e. Duration of guarantee, bond, service or maintenance contract.
 - f. Contractor's name, address, telephone number and name of principal.
 - g. Provide information for University personnel:
 - 1) Proper procedure in case of failure.
 - 2) Circumstances that might affect validity of guarantee or bond.
- D. Form of Submittal: Prepare in duplicate packets.
 1. Size: 8-½" x 11" sheets punched for 3-ring binder. Fold larger sheets to fit into binders.
 2. Identify each packet on cover with typed or printed title, "GUARANTEE AND BONDS", and the following:
 - a. Title of Project
 - b. Project Number
 - c. Name of Contractor
 3. Binders: Commercial quality, 3-ring, with durable and cleanable plastic covers.
- E. Time of Submittals: Submit within ten (10) calendar days of Substantial Completion, prior to request for final payment. When work activity is delayed materially beyond date of Substantial Completion, provide updated submittal within ten (10) calendar days after Final Completion, listing date of Final Completion as the start of the Guarantee period.
- F. Submittals Required: Submit guarantees, bonds, service or maintenance contracts specified in individual Sections of the Specifications.
 1. Contractor shall collect and assemble all written warranties and guarantees into a binder.
 2. Submit all required Warranties and Guarantees on letterhead of Contractor.

1.06 PROJECT RECORD DOCUMENTS

- A. Maintenance of Record Documents and Samples:

1. Provide complete set of Record Drawings and Specifications, showing every change from original Contract set, including all Addenda, Change Order, job decisions, etc. Prints for this purpose may be obtained from University's Representative.
 2. When work is complete and prior to final payment, submit one (1) complete set of all record documents, marked to show any deviation from the original Contract set. These documents are to be an accurate description of all work as-built.
 3. Prior to Application for final payment, a set of drawings shall be obtained from University's Representative and all changes, as noted on the Record Drawings shall be incorporated thereon. The set of drawings, together with one (1) copy therefrom, shall be delivered to University's Representative.
 4. Label and file record Documents and samples in accordance with Section number listings in the Project Specifications Table of Contents. Label each document "PROJECT AS-BUILT" in neat, large, printed letters. Each document and sample shall include the University's Project title and Project number for reference purposes.
 5. Maintain Record Documents in a clean dry and legible condition. Do not use Record Documents for construction purposes. Keep record Documents and samples available for inspection by University.
 6. Record Schedule: Contractor shall provide Record Schedule of construction activities. Schedule shall be in same format as specified in SECTION 01320 – CONTRACT SCHEDULES.
- B. Submittals: At Contract closeout, deliver Record Documents and samples as required by SECTION 01770 – CLOSEOUT PROCEDURES.
1. Transmit with cover letter in duplicate, listing:
 - a. Date.
 - b. Project title and Project number.
 - c. Contractor's name, address and telephone number.
 - d. Number and title of each Record Document.
 - e. Signature of Contractor or authorized representative.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01780

GUARANTEE

Project Title: _____

Project Location: _____

Project Number: _____ DATE: _____

GUARANTEE FOR _____ (the "Contract"),

(Specification SECTION and Contract No.)

between The Regents of the University of California ("University") and

_____ ("Contractor").

(Name of Contractor or Subcontractor)

hereby guarantees to University 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 _____ months after the date of the guarantee the undersigned receives notice from University 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 10 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 10 days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize University to undertake such correction, repair, or replacement at the expense of the undersigned; and Contractor will pay to University promptly upon demand all costs and expenses incurred by University in connection therewith.

SUBCONTRACTOR

Signed: _____ Title: _____

Typed Name: _____

Name of Firm: _____

Contractor License Classification & Number: _____

Address: _____

Telephone Number: _____

CONTRACTOR

Signed: _____ Title: _____

Typed Name: _____

Name of Firm: _____

Contractor License Classification & Number: _____

Address: _____

Telephone Number: _____

Project No. 9557320
East Wing 3RD Floor Bed Re-licensure
OSHDPD #S202226-34-00

REPORT OF WORK REQUIRED BY WARRANTY

To:	Jim Davis, University Representative
From:	

[illegible]

Prepared by: _____
(Print Name) Signature Date

In accordance with the terms and conditions of the Contract, the Contractor has agreed that, if at any time within _____ months after the date of the guarantee the Contractor receives notice from University that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the Contractor will, within 10 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.

Prompt notification to be provided by the University Representative to the appropriate Contractor.

**SECTION 01810
PLUMBING/HVAC TESTING PROCEDURES**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for Adjusting and Balancing Systems

1.02 RELATED SECTIONS

- A. Section 01450 – QUALITY CONTROL: Testing organization services.
- B. Section 01750 – STARTING, AND ADJUSTING SYSTEMS: Starting and adjusting equipment prior to commissioning.
- C. Section 15890 – DUCTWORK: Testing.
- D. Section 15990 – PLUMBING/HVAC FINAL TESTING, ADJUSTING & BALANCE
- E. General Conditions of the Contract: Inspections, tests and approvals required by governing authorities.

1.03 SUBMITTAL REQUIREMENTS

- A. Service Provider: Prior to start of work, submit name or organization proposed to perform services. Designate managerial responsibilities for coordination of all testing activities.
- B. Qualifications: Submit documentation to confirm organization qualifications.
- C. Report Forms: Submit three (3) preliminary specimen copies of each report form proposed for use.
- D. Final Report Submission: Fourteen (14) calendar days prior to completion submit three (3) copies of final reports. Submit reports of testing that are postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

1.04 GENERAL PROCEDURES

- A. Procedural Compliance: Comply with procedural standards of certifying association under whose standard services will be performed.
- B. Notification: Notify University's Representative, in writing, minimum of fourteen (14) calendar days prior to beginning service operation.
 - 1. Record Keeping: Accurately record date for each step.
 - 2. Report to University's Representative any defects or deficiencies noted during performances of services.

1.05 FINAL REPORTS

- A. Organization having managerial responsibility shall make reports.
- B. Each Form shall bear signature of recorder, and that of supervisor of reporting organization.
- C. Identify each instrument used and latest date of calibration of each.

1.06 CONTRACTOR RESPONSIBILITIES

- A. Prepare each system for testing.
- B. Coordinate with testing organization; provide access to equipment and systems. Operate systems at designated times, and under conditions required for proper testing.
- C. Notify testing organization fourteen (14) calendar days prior to time system will be ready for testing.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 PREPARATION

- A. Provide instruments required for testing operations. Make instruments available to University to facilitate spot checks during testing. Retain possession of instruments and remove at completion of services.
- B. Verify installation of system to be tested is complete and in continuous operation.
- C. Verify ambient conditions and related facilities are in full operation.

3.02 SCHEDULE OF SYSTEMS REQUIRING TESTING SERVICES

- A. Test piping at completion of roughing in, in accordance with the following schedule and show no loss in pressure or visible leaks after minimum duration under water pressure as set forth in Division 15.
- B. Testing equipment, materials, and labor shall be furnished by Contractor.
- C. Repair piping systems sections which fail required piping test, by disassembly and reinstallation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

END OF SECTION 01810

**SECTION 01820
DEMONSTRATION AND TRAINING**

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for Demonstration of Equipment Operation and Instruction of University Personnel.

1.02 RELATED SECTIONS

- A. Section 01780 – CLOSEOUT SUBMITTALS
- B. Section 01810 – PLUMBING/HVAC TESTING PROCEDURES

1.03 SUBMITTALS

- A. Submit preliminary schedule for University Representative approval, listing times and dates for demonstration of each item of equipment and each system, in writing, minimum of fourteen (14) calendar day prior to activities.
- B. Submit reports within (1) week after completion of demonstrations, that demonstrations and instructions have been satisfactorily completed. Give time and date of each demonstration, and hours devoted to demonstration with a list of persons present.

1.04 QUALITY ASSURANCE

- A. Equipment installed under Contract shall operate quietly and free of vibration. Adjust, repair, balance properly, or replace equipment producing objectionable noise or vibration in occupied areas of building. Provide additional brackets, bracing, etc., to prevent such noise or vibration. Systems shall operate without humming, surging or rapid cycling.
- B. University will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon time.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 PREPARATION

- A. Verify equipment has been inspected and put into operation.
- B. Have copies of completed operation and maintenance manual at hand for use in demonstration instructions.

3.02 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of equipment and systems to University two (2) weeks prior to date of final inspection. For equipment requiring seasonal operation, perform instructions for other seasons within six (6) months of completion.

- B. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times, at equipment location.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

END OF SECTION 01820

SECTION 01 56 10.13 INTERIM LIFE SAFETY MEASURES (ILSM)

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Procedures for implementing Owner's Interim Life Safety Measures (ILSM) Program.
 - 2. Requirements for the Owner's ILSM Program.

1.2 DEFINITIONS

- A. Interim Life Safety Measures are a series of eleven administrative actions required to be taken to temporarily compensate for the hazards posed by existing life safety deficiencies or construction activities.
- B. Safety Systems: Systems required by Code for occupant safety and protection. Examples: Fire barriers; smoke barriers; exit pathways; emergency power; fire alarms; medical gases; HVAC systems; fire-rated doors.

1.3 SYSTEM DESCRIPTION AND PLANNING

- A. Because many of the administrative actions require the construction of barriers, the installation of temporary systems, and the training of personnel, ILSM planning will begin prior to the beginning of the Project in coordination with the Contractor.

1.4 QUALITY ASSURANCE

- A. Interim Life Safety Measures (ILSM) program shall comply with current JCAHO Standards.
 - 1. https://www.jointcommission.org/standards_information/edition.aspx
- B. Set up control procedures so that ILSM are adhered to. Contractor's responsibility is to properly notify Architect of anticipated and actual problems complying with ILSM.

PART 2 PRODUCTS

2.1 MATERIALS

- A. New or used, suitable for purpose.

2.2 OWNER'S ILSM PROGRAM

- A. Buildings or areas under construction must maintain escape facilities for construction workers at all times. Means of egress in construction areas must be inspected daily.
 - 1. Exits shall provide free and unobstructed egress. Personnel shall receive training if alternative exits must be designated.
 - 2. Maintain free and unobstructed access to emergency departments/services and for emergency forces.
 - 3. Ensure that fire alarm, detection, and suppression systems are not impaired. Providing temporary, but equivalent, system when any fire system is impaired. Temporary systems must be inspected and tested monthly.
 - 4. Temporary construction partitions are smoke tight and built of noncombustible or limited combustible material that will not contribute to the development or spread of fire.
 - 5. Provision of additional firefighting equipment and use training for personnel.
 - 6. Prohibition of smoking in or adjacent to all construction areas.

7. Development and enforcement of storage, housekeeping, and debris removal practices that reduce the flammable and combustible fire load of the building to the lowest level necessary for daily operations.
8. Conductance of a minimum of two fire drills per shift per quarter.
9. Regular hazard surveillance of buildings, grounds, and equipment with special attention to excavations, construction areas, construction storage, and field offices.
10. Training personnel when structural or compartmentation features of fire safety are compromised.
11. Conductance of organization-wide safety education programs to ensure awareness of any LSC deficiencies, construction hazards, and these ILSM.

PART 3 EXECUTION

3.1 PROJECT ILSM PROCEDURES

- A. The Contractor is responsible for the safety of persons and property and compliance with all applicable statutes, rules, regulations, and orders for work under this Contract. Implement the following procedures. Refer to Section 01 52 00.
 1. Material for construction operations shall be brought in and work conducted as to avoid any interference with existing Owner's facilities or normal operations.
 2. Every effort shall be made to limit dust, noise, weather, and fire hazards during construction and a secured dust wall around each space and ceiling area will be constructed where required to ensure health and safety of those spaces not involved during each stage of construction.
- B. Refer to Section 01 11 00 - Summary of Work. The Contractor is responsible for developing a safety program and site management program as specified.
 1. Provide correction plan for compromised utility services. Example: Medical gases; medical air vacuum; electricity (normal, critical and Life Safety); water; ventilation; steam and any other such utility service.
- C. Maintain free and unobstructed access and exits to public ways as specified and as indicated on drawings.
 1. Modify existing walkways and cover walkways to provide access to existing facilities for use by public and Owner's personnel as indicated.
 2. Other exits as indicated.
- D. Provide alternate means of exit where indicated and notify Owner of timing of switchover.
 1. Alternate means are to be in place prior to abandonment of existing means of exit. Allow the Owner one week to train staff after creating alternate means of exit and before abandoning existing means of exit.
 - a. Alternate means must be approved by Fire Marshall prior to abandonment.
 2. Alternate exit at existing boiler plant (if required).
- E. Maintain escape routes for construction workers. Inspect means of egress in construction areas daily and report any discrepancies to the Contractor's Safety Director for correction.
 1. Report problems and measures taken to correct problems to Architect.
- F. Develop and enforce fire safe means of storage, housekeeping, and debris removal as specified.
- G. Ensure that fire alarm, detection, and suppression systems are not impaired. Refer to Section 01 11 00.

3.2 MEETINGS

- A. Progress meetings are specified in Section 01 31 23 - Project Management and Coordination, attend meetings with report on control measures being used to insure compliance and ILSM.

END OF SECTION

SECTION 01 57 13 CONSTRUCTION NOISE CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
1. Methods and procedures to protect building occupants and surrounding area from excessive noise associated with construction work and are referred to as the Noise Control Policy.

1.2 DEFINITION

- A. A-Weighting: A standard frequency weighting which is commonly employed to measure the loudness or "noisiness" of sounds. A-weighting filters the microphone signal in a manner which correlates better with the sensation of the human ear.
- B. A-weighting is required by regulation promulgated by the U.S. EPA, the California Department of Aeronautics, CalTrans, and others. A 10 dB increase in sound level is perceived by people to be twice as loud. All noise data herein are A-weighted. Usually the unit of A-weighted sound level is written as dBA.

1.3 QUALITY ASSURANCE

- A. References:
1. San Francisco Noise Ordinance which prohibits the operation of equipment that emits noise in excess of 85 dBA when measured at a distance of 100 feet.
- B. Enforcement:
1. Monitor noise levels through measurements to establish levels in excess of 85 dBA at 50 feet, and implementing additional mitigation procedures based on recommendations of acoustical consultant.

1.4 SCHEDULING

- A. Schedule construction work generating severe levels of noise in advance, and set times as required and determined acceptable by Owner.

PART 2 PRODUCTS

2.1 CONSTRUCTION NOISE ASSESSMENT

- A. Construction Noise levels at a distance of 50 feet for each phase of construction are shown below. Data are based on data for similar construction activities and published data.

NOISE LEVELS GENERATED BY CONSTRUCTION ACTIVITIES AT 50 FEET.

Excavation:	L_{eq} (dBA)	L_{Lmax} (dBA).
Earthmoving	90	95-100.
Excavation.	90	95-100
Grading.	80	85-90
Foundation:		
Earth Drilling	90	95-100.
Erection:		

Concrete Pouring	85	90-95.
Framing with impact wrenches.	95	100-105
Framing without impact wrenches	85	90-95.
Pre-Construction	90	95- .

PART 3 EXECUTION

3.1 MITIGATION

- A. Attempt to implement the following construction noise mitigation measures on this Project:
1. Equip internal combustion engine-driven construction equipment with good condition best available mufflers. Use quiet electric-powered compressors and generators.
 2. Use welded rather than T.C. bolted steel connections when possible to minimize use of impact wrenches.
 3. Erect barriers around noise generating operations.
 4. Turn off engines and compressors when not in operation; no idling.
 5. Limit noise generating construction activities to times between 7:30 am and 3:30 pm.
 6. Avoid blasting activities. Use ball and crane demolition techniques.
 7. Define truck routes to confine noisy trucks to streets that currently have the heaviest traffic. Develop a truck staging area away from acoustically sensitive areas.
 8. Use and electric-powered tower crane instead of a diesel-powered truck crane.
 9. Use steel structural frames in lieu of concrete structural frames to yield a much shorter assembly time.
 10. Pre-cut metal decks and metal studs off site to minimize on-site sawing.
 11. For excavation, use drilled soldier piles with wood lagging instead of sheet pile driving techniques where possible. Avoid impact pile driving.
 12. Retain an acoustical consultant to provide assistance with developing additional noise attenuation techniques where needed.
 13. Chemically demolish concrete where possible.
 14. Avoid hammer drilling; use coring bits, instead. Avoid using power-actuated fasteners; use concrete screws, instead. Avoid sand blasting.
 15. Avoid sheet metal debris chutes; use plastic chutes, instead.
- B. Contractor is responsible for site supervision of potential sources of noise (e.g., material delivery, shouting, debris box pick-up and delivery) for all trades. Maintain awareness among trades of noise sensitivity of Project.

3.2 FIELD QUALITY CONTROL

- A. Enforcement of Noise Control Policy:
1. Measurements will be taken on an unscheduled basis to document noise levels.
 2. Information will be noted and transmitted to Contractor.
 3. A record of noise violations will be maintained.

END OF SECTION

SECTION 01 73 25

SEISMIC RESTRAINT REQUIREMENTS FOR NONSTRUCTURAL COMPONENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide seismic restraint of nonstructural components to withstand seismic forces and seismic deformations without displacing or overturning. For designated nonstructural components, provide installations capable of providing post-earthquake functionality.
- B. Work in this section includes furnishing and installing complete seismic restraint systems. Work in this section may also include the seismic restraint design and/or equipment/product certifications to be submitted for review by the registered design professional.

1.2 SCOPE

- A. The architectural, medical equipment, mechanical, electrical, and plumbing components and systems identified in the attached Responsibility Matrix shall be designed and constructed for seismic demands.

1.3 DEFINITIONS

- A. Professional Engineer - A professional engineer is one who is legally qualified to practice in the jurisdiction where the Project is located, who is experienced in providing engineering services of the kind indicated and is registered with the state where the Project is located.
- B. Seismic Forces: Forces acting in any direction on a nonstructural component and related system due to the action of an earthquake as defined in the Building Codes currently in effect where the Project is located.
- C. Seismic Deformations: Drifts, deflections and seismic relative displacements determined in accordance with the applicable seismic requirements of the Building Codes currently in effect where the Project is located.
- D. Restraint/Bracing: Bracing or anchorage used to limit movement under seismic forces. Cables or rigid elements (strut, pipe, angles, etc) used to resist forces by uniaxial tension or compression. The term "bracing" may also be used to describe design to resist lateral forces through the use of wall or frame elements.
- E. Support: Elements used to support the weight (gravity load) of an item. Where the support is located at a seismic brace, the element may also resist tension/compression reactions from the restraint system.
- F. Anchorage: Connection to structure typically through the use of welding, bolts, screws, post-installed anchors or other fasteners selected to meet the Building Codes currently in effect where the Project is located.
- G. Designated Seismic System: Those architectural, electrical and mechanical systems and their components that require seismic design in accordance with ASCE 7 and for which the component importance factor, I_p , is 1.5 according to ASCE 7 or listed as 1.5 in Section 017325.1.2.
- H. Inspection Body: Organization or individual accredited to ISO 17020 and regularly engaged in factory inspection services for seismic restraint of non-structural components and equipment.
- I. Special Inspector: An IAS accredited IBC special inspection agency or qualified professional engineer who demonstrates competence, to the satisfaction of the building official (or Authority Having Jurisdiction [AHJ]), for inspection of the designated seismic systems. The owner or the registered design professional in responsible charge acting as the owner's agent shall employ one or more special inspectors to provide periodic inspections during installation of designated seismic systems.

- J. AHJ: Authority Having Jurisdiction – The governmental agency or sub-agency that regulates the construction process. This may be a local building department, state agency, federal entity or other body or bodies having statutory authority.
- K. OSHPD: California Office of Statewide Health, Planning and Development.
- L. ICC-ES: International Code Council Evaluation Service.
- M. IAS: International Accreditation Service, Inc.
- N. CBC: California Building Code.
- O. VISCMA: Vibration Isolation and Seismic Control Manufacturers Association.
- P. ASCE: Minimum Design Loads for Buildings and Other Structures.

1.4 RELATED SECTIONS

- A. Coordinate and comply with the requirements of the following:
 - 1. Section 01 73 24 – Anchorage and Sleeving
 - 2. Section 05 45 00 – Metal Support Assemblies
 - 3. Section 05 50 00 – Metal Fabrications
 - 4. Section 09 22 16 – Non-Structural Metal Framing
 - 5. Section 09 51 00 – Acoustical Ceilings
 - 6. Section 21 05 48 – Vibration and Seismic Controls for Fire Suppression Piping and Equipment
 - 7. Section 22 05 48 – Vibration and Seismic Controls for Plumbing Piping and Equipment
 - 8. Section 23 05 48 – Vibration and Seismic Controls for HVAC
 - 9. Section 26 05 48 – Seismic Controls for Electrical Systems

1.5 APPLICABLE PUBLICATIONS

- A. The most recent edition of publications listed below (including amendments, addenda revisions, supplements and errata) form a part of this specification to the extent referenced unless otherwise noted. The publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
 - 1. 355.2 Qualification for Post-Installed Mechanical Anchors in Concrete and Commentary.
 - 2. 318 Appendix D Anchoring to Concrete.
- C. American Institute of Steel Construction (AISC): Load and Resistance Factor Design American Society of Civil Engineers Minimum Design Loads for Building and Other Structures.
- D. American Society for Testing and Materials (ASTM):
 - 1. A36/A36M Standard Specification for Carbon Structural Steel.
 - 2. A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. A307 Standard Specification for Carbon Steel Bolts and Studs; 600,000 PSI Tensile Strength.
 - 4. A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 5. A325M Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric).
 - 6. A490 Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
 - 7. A490M Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
 - 8. A500/A500m Standard Specification for Cold-Form Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 9. A501 Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 10. A615/A615M Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 11. A992/A992M Standard Specification for Steel for Structural Shapes for Use in Building Framing.

12. A996/A996M Standard Specification for Rail-Steel and Axel-Steel Deformed Bars for Concrete Reinforcement.
 13. E488-96 Standard Test Method for Strength of Anchors in Concrete and Masonry Elements.
 14. E580 Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- E. American National Standards Institute (ANSI) and Rack Manufacturers' Institute (RMI): Specification For The Design, Testing and Utilization of Industrial Steel Storage Racks (ANSI MH16.1).
- F. American Welding Society (AWS):
1. AWS D1.1 Structural Welding Steel
 2. AWS D1.3 Structural Welding Sheet Steel
- G. International Code Council Evaluation Service (ICC-ES): Index of Reports can be found at <http://www.icc-es.org/reports/index.cfm>
- H. National Fire Protection Association: Installation of Sprinkler Systems (NFPA-13)
- I. OSHPD Code Application Notice 2-1708A.5 – Certification of Equipment and Nonstructural Components
- J. American Society of Mechanical Engineers (ASME)
1. Standard B31 Standards for Pressure Piping.

1.6 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) latest adopted Edition by the jurisdiction where the Project is located and applicable local and/or statewide adopted amendments.
- B. Special Seismic Certification – Provide certification in accordance with CBC, Chapter 17 and ASCE 7 Chapter 13 requirements for designated seismic systems as indicated on the Responsibility Matrix.

1.7 PROJECT SEISMIC DESIGN CRITERIA

- A. Seismic Design Category – See General Structural Notes and Abbreviations Sheet **S001**.
- B. Seismic Design Force – Calculation of seismic design force shall be based on the requirements of Chapter 13 of ASCE 7 with the following seismic design parameters
1. See General Structural Notes and Abbreviations Sheet **S001** for building seismic design criteria and parameters.
 2. Component importance factor (I_p) = 1.0 or 1.5 as indicated in the Responsibility Matrix or as required by ASCE 7 Section 13.1.3.
 3. Component amplification factor (a_p) and component modification factor (R_p) shall be determined in accordance with ASCE 7 Tables 13.5-1 and 13.6-1
- C. Seismic Relative Displacement – Design shall accommodate seismic relative displacement of **<insert ratio (e.g. 0.02)>** times the story height in addition to thermal movement that may be present.
- $\Delta 1-2$ = inter-story drift between floors 1 and 2 = X.XX
 $\Delta 2-3$ = inter-story drift between floors 2 and 3 = X.XX
 $\Delta 3$ -Roof = inter-story drift between floors 2 and 3 = X.XX
- D. Seismic Separation between Independent Structures – Components crossing seismic separations shall be designed to accommodate relative seismic movement between structures. Locations of seismic separations are shown on the drawings. Use the following to determine the range of movement required at each floor. Components shall be independently anchored to each structure.
1. $D_{A1-B1} = XX"$ (i.e. $\pm xx"/2$)
 2. $D_{A2-B2} = XX"$ (i.e. $\pm xx"/2$)
 3. $D_{A3-B3} = XX"$ (i.e. $\pm xx"/2$)

4. $D_{\text{ARoof-BRoof}} = XX''$ (i.e. $\pm xx''/2$)

1.8 SUBMITTALS

- A. Shop Drawings: Submit seismic restraint shop drawings in accordance Section 01 33 23:
 - 1. Incorporate seismic restraint layouts, details, erection drawings, fastener details, anchorage details, materials and member sizes into the specific component shop drawings in accordance with the individual specification article. Where the individual specification article does not require the shop drawings to be submitted, provide standalone seismic restraint shop drawings.
 - 2. Seismic restraint shop drawings shall be prepared or their preparation shall be overseen by a Professional Engineer, licensed in the state where the Project is located and is experienced in designing seismic restraints for nonstructural components as required by the authority having jurisdiction.
 - 3. The use of proprietary restraint systems with a certificate of compliance verified and listed by an IAS accredited inspection body is acceptable.
- B. Calculations: Submit signed engineering calculations concurrently with shop drawings:
 - 1. Seismic restraint calculations shall be prepared and signed by a Professional Engineer, licensed in the state where the Project is located, indicating structural integrity of members, anchors, fasteners and connections to building structure in accordance with specified criteria and the applicable building codes.
- C. Special Seismic Certification of Mechanical and Electrical Equipment and Distribution Systems:
 - 1. Each manufacturer of designated seismic system components shall provide a certificate of compliance indicating that the component and its mounting system or anchorage have been tested and/or analyzed in accordance with ASCE 7 to withstand required seismic loads and maintain operability.

1.9 QUALITY ASSURANCE

- A. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings and other structural data.
- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services in the area of seismic restraint of nonstructural components and systems.
- B. Special Seismic Certification of Mechanical and Electrical Equipment and Distribution Systems:
 - 1. Each manufacturer of designated seismic system components shall provide a certificate of compliance indicating that the component and its mounting system or anchorage have been tested or analyzed in accordance with ASCE 7 to withstand required seismic loads and maintain operability. Depending on the contents or functionality of the designated seismic system as defined in ASCE 7, certification shall be provided by an actual test on a shake table with three-dimensional shock tests, an analytical method using dynamic characteristics and forces and/or experience data based upon nationally recognized procedures acceptable to the authority having jurisdiction. Certificate must be verified by an IAS accredited inspection body or other independent inspection entity acceptable to the Authority Having Jurisdiction. Components shall be labeled with an identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an accredited agency that indicates that the representative sample of the product or material and its testing have been evaluated and listed by an accredited inspection body agency.
 - 2. If a particular component has no manufacturer available that has been evaluated and listed by an accredited inspection body agency, then qualification must be by analysis performed by a professional engineer registered in the jurisdiction where the Project is located. Professional engineer must be approved by the authority having jurisdiction and experienced in providing engineering services of the kind indicated. Analysis must include an evaluation of stress and deflection developed through the entire load path from the center of applied seismic load to the equipment anchorage. Analysis must consider dynamic characteristics and the response spectrum required by code.

3. Special Seismic Certification for distribution systems such as piping and ductwork shall include a stress analysis of the pipe/duct, supports, bracing and anchors. The stress analysis shall include gravity and seismic demands and shall include an analytical assessment of connections and consideration of movement of points of attachment. The effects of in-line devices, where present, shall be considered in the analysis. Conformance with NFPA 13 2010 will satisfy Special Seismic Certification requirements for fire protection piping.
- C. Coordination:
1. Do not install seismic restraints until seismic restraint submittals have been reviewed and accepted by the entity/entities identified on the Responsibility Matrix.
 2. Verify that multiple systems installed in the same vicinity can be installed without conflict.
 3. Verify tolerances between installed items to confirm that unbraced components will not come into contact with restrained equipment or structural members during an earthquake. When contact is possible, provide seismic restraint or provide justification to the satisfaction of the registered design professional in responsible charge of the project that contact will not cause unacceptable damage to the components in contact, their supports, finishes or other elements that are contacted.

PART 2 - GENERAL

2.1 STEEL

- A. Structural steel: ASTM A36, A36M, A992.
- B. Structural tubing: ASTM A500, Grade B.
- C. Steel pipe: ASTM A53/A53M, Grade B.
- D. Bolts and nuts: ASTM, A307, A325, A325M, A490, A490M, ASTM A563.
- E. Lag bolts and screws: ASME B18.2.1 (ASME B18.2.3.8M), ASTM A563.
- F. Powder driven anchors: NES NER-272.
- G. Nails: ASTM F1667.

2.2 LIGHT GAGE NON-LOAD BEARING METAL FRAMING

- A. Metal studs: A653 Grade 33, ASTM A1011 Grade 33, ASTM A446 Grade A or D, or ASTM A570.
- B. Tie wires: ASTM A641/A641M.
- C. Screws for fastening to cold-formed metal framing: ANSI B18.6.4.

2.3 WELDING

- A. Welding filler metal: AWS A5.1.

2.4 POST-INSTALLED ANCHORS

- A. Expansion or sleeve anchors: Pre-qualified for use in seismic applications per ASTM E488.
- B. Adhesive anchors: Pre-qualified for use in seismic applications per ASTM E488.

2.5 SEISMIC RESTRAINT CABLES

- A. Prestretched galvanized carbon steel cable 7x19 strand core, ASCE-19, ASTM A-1023 1A, ASTM A-603 or stainless steel.

2.6 CHANNEL STRUT AND FITTINGS

- A. Strut: ASTM A 1011SS Gr 33 or ASTM A 653 Gr 33.
Fittings: ASTM A 575, A 576, A36 or A 635.

PART 3 - EXECUTION

3.1 CONSTRUCTION, GENERAL

- A. For items identified in the Responsibility Matrix furnish and install supports, braces, connections, hardware and anchoring devices to withstand code-required seismic forces and seismic deformations without shifting or overturning. For components with $I_p = 1.5$, in addition to providing code-required seismic forces and deformations, provide installations capable of providing post-earthquake functionality.
- B. Construct seismic restraints and anchorages that do not inhibit thermal expansion and contraction of distribution systems. Utilize ASME Standard B31 when utilizing common supports for both thermal and seismic loading.
- C. Maintain fire ratings of assemblies as specified elsewhere or on the drawings in addition to compliance with the criteria set forth below.

3.2 NONSTRUCTURAL EXTERIOR WALL COMPONENTS

- A. Nonstructural exterior wall framing
 - 1. Design framing to resist out-of-plane seismic design force, movement due to temperature changes and relative vertical movement between floors.
 - 2. Design framing to accommodate code-required inter-story drift without damage that compromises the exterior wall water, moisture and thermal barriers.
 - 3. Design framing with sufficient out-of-plane stiffness to prevent damage to cladding or veneer when subjected to code-required out-of-plane forces.
- B. Veneer
 - 1. Fasten veneer to substrate to accommodate out-of-plane seismic design force and deformation of supporting framing.
 - 2. Anchored veneer shall be detailed to prevent moisture penetration from weather that could corrode anchors.
- C. Nonstructural prefabricated panels
 - 1. Design prefabricated panels and connections capable of resisting in-plane and out-of-plane forces and story drift deformations in accordance with ASCE 7.
- D. Glazing
 - 1. Design glazing to resist out-of-plane seismic design force.
 - 2. Design glazing to accommodate relative displacement to resist fallout as set forth in ASCE 7 Section 13.5.9.1 and not less than 0.5 inch.
 - 3. Drift limit for glass components shall be determined in accordance with AAMA 501.6 or by engineering analysis.
 - 4. In lieu of calculations, compliance with design criteria may be established by testing in accordance with AAMA 501.4.

3.3 INTERIOR PARTITIONS

- A. Heavy partitions (masonry, glass block, etc.)
 - 1. Design wall and connections to resist out-of-plane seismic design force.
 - 2. Provide connection detail between the building structure and heavy partition to accommodate seismic relative displacement between partition and structure.
 - 3. Maintain fire rating at connections in rated construction.
- B. Light partitions (metal stud or wood stud)
 - 1. Design partitions to resist out-of-plane seismic design force. Design force shall be based on the weight of the partition framing, finishes, soffits, connected casework or equipment, and ceilings for which it provides bracing. Out-of-plane design force shall not be less than 5 psf.
 - 2. Design partitions to accommodate inter-story drift.
 - 3. Fasten veneer to partition framing to resist code required forces and deformation of studs.

4. Where partition does not extend to the structure, the partition height does not exceed 9 feet, the linear weight of the partition does not exceed the product of 10 pounds times the height in feet of the partition and the partition horizontal load does not exceed 5 psf, lateral bracing to the building structural is not required. For all other conditions, provide supplemental bracing or framing to resist out-of-plane seismic design force. Such bracing or framing shall be independent of splayed wire ceiling bracing. Design wall bracing or framing for compatibility with ceiling deflection requirements, fire ratings and architectural treatments.
5. Design support and bracing to resist seismic design force in any direction.
6. When attaching items to interior partition walls, install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.

3.4 CEILING

- A. Suspended acoustic tile ceilings
 1. Design and install ceiling in accordance with ASTM E580.
 2. For Seismic Design Categories D, E and F, provide bracing at regular intervals to resist code design forces and limit vertical and lateral movement.
 3. Suspended ceilings with areas less than or equal to 144 square feet and that are surrounded by walls or soffits that are laterally braced to the structure above are exempt from seismic design requirements.
 4. Where ceilings are unbraced or splayed wire bracing is used to resist seismic forces and limit lateral deflections, provide 1 inch clearance around all penetrations through the ceiling sprinkler drops. If flexible sprinkler drops are used and have been certified to accommodate 1 inch of movement, the 1 inch clearance requirement may be waived.
 5. Provide independent support of lighting fixtures, diffusers, cable trays, electrical conduit and other ceiling appurtenances.
 6. The ceiling system weight for determining seismic forces shall be taken as not less than 4 psf.
- B. Ceilings directly fastened to structural framing or furred with materials that are directly applied to structural framing
 1. Fasten ceiling to framing to resist the vertical seismic design forces and the weight of the ceiling and all connected light fixtures, sprinklers, HVAC appurtenances.

3.5 PARAPETS, ROOF SCREEN WALLS, APPENDAGES, CANOPIES, MARQUEES, SIGNS, CHIMNEYS, AND STACKS

- A. Exterior appendages
 1. Design component and connections to resist out-of-plane seismic design force and code wind force.
 2. Design and provide supplementary framing and/or backing as required to support and anchor to structural framing.
 3. Provide details that do not compromise water, moisture and thermal barriers.

3.6 ACCESS FLOORS

- A. Design forces shall be based on the weight of the access floor system, 100 percent of the weight of all equipment fastened to the floor and 25 percent of the weight of all equipment supported by but not fastened to the floor.
- B. Design access flooring for overturning effects of equipment fastened to the access floor panels shall also be considered
- C. Design each individual pedestal such that the maximum concurrent axial load due to overturning effects shall not exceed the portion of the access floor system weight assigned to the pedestal under consideration.
- D. Provide restraint to resist seismic design force in any direction. Use components that have been tested in accordance with CISCA "Recommended Test Procedures for Access Floors."

- E. The use of adhesive-only anchorage of pedestals is prohibited in Seismic Design Categories D, E and F.
- F. Special Access Floor shall be designed in accordance with ASCE 7, Section 13.5.7.2.

3.7 STAIRWAYS

- A. Stairs (including treads, risers, landings and enclosures)
 - 1. Design components and connections to resist seismic design force. Design stairs to accommodate inter-story drift. Acceptable means shall include isolating the stair from experiencing internal stresses due to inter-story drift or provide substantiating evidence to demonstrate that stair can accommodate inter-story drift.
 - 2. Design and provide supplementary framing as required to support and anchor to structural framing.
 - 3. Design components and connections to maintain fire rating when subjected to seismic design forces and deformations.

3.8 EQUIPMENT SUPPORT SYSTEMS

- A. Suspended architectural and medical equipment and systems
 - 1. Design support and bracing to resist seismic design force in any direction.
 - 2. Provide flexible connection between equipment and interconnected components (piping, med gas, electrical wiring, etc).
 - 3. As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an accredited inspection body is acceptable. Use of a certified product does not preclude the requirement for shop drawings.

3.9 FREESTANDING WALLS OR FENCES

- A. Freestanding walls and fences:
 - 1. Design wall/fence and foundation capable of resisting out-of-plane seismic design force and code wind forces including out-of-plane forces.

3.10 MECHANICAL AND PLUMBING COMPONENTS

- A. Floor and base-mounted mechanical equipment (boilers, furnaces, pumps, chillers, manufacturing, process machinery, etc.), vibration isolated equipment and associated system vibration and seismic controls for connections.
 - 1. Design equipment anchorage to resist seismic design force in any direction.
 - 2. Design vibration and seismic controls for equipment to include base and isolator requirements.
 - 3. Provide flexible connection between equipment and interconnected piping.
 - 4. Where equipment is mounted on vibration isolators and restraints, use isolators and restraints designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.
 - 5. Provide supplemental steel or concrete base as required for mounting equipment on isolators. Where equipment is not designed to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator base plate anchorage.
 - 6. Where concrete floor thickness is less than required for expansion anchor installation per ICC-ESR, install through bolt in lieu of expansion anchor. Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws or other mechanical fasteners, furnish and install supplemental framing or blocking to transfer loads to structural elements.
- B. Suspended mechanical equipment
 - 1. Design support and bracing to resist seismic design force in any direction.
 - 2. Provide flexible connection between equipment and interconnected piping.
 - 3. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.
As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an accredited inspection body is acceptable. Use of a certified product does not preclude the requirement for shop drawings.

C. Wall-mounted mechanical equipment

1. Design support and bracing to resist seismic design force in any direction.
2. Install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.

D. Piping

1. Provide seismic bracing for piping as required by Section 1.2.
2. Provide supports, braces and anchors to resist gravity and seismic design forces.
3. Design piping and piping risers to accommodate inter-story drift.
4. Provide flexible connections between floor-mounted equipment and suspended piping; between unbraced piping and restrained suspended items; as required for thermal movement; at building separations and seismic joints; and wherever relative differential movements could damage pipe in an earthquake.
5. Brace resiliently-supported pipe with cable bracing or alternate means designed to prevent transmission of vibrations and noise to structure.
6. Brace every run (5 feet or more in length) with two transverse and one longitudinal bracing locations. For pipes and connections constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections) provide transverse bracing at not more than 40 feet on center and longitudinal bracing at spacing not more than 80 feet on center. For pipes and their connections constructed of non-ductile materials (cast iron, no-hub pipe and plastic or non-UL listed grooved coupling pipe), provide transverse bracing at not more than 20 feet on center and longitudinal bracing at spacing not more than 40 feet on center. Alternatively, explicitly design piping and connections to resist gravity and seismic forces and seismic deformations.
7. Provide lateral restraint for risers at not more than 30 feet on center or as required for horizontal runs, whichever is less.
8. Where piping is explicitly exempt from seismic bracing requirements, provide flexible connections between piping and connected equipment, including in-line devices such as VAV boxes and reheat coils.
9. Where piping is explicitly exempt from seismic bracing requirements, install piping such that swinging of the pipes will not cause damaging impact with adjacent components, finishes or structural framing. This will be considered satisfied if there is horizontal clear distance of at least 2/3 the hanger length between subject components. If swinging of exempted piping can cause damaging contact with adjacent components, finishes or structural framing, add swing restraints as required to eliminate contact.
10. As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an accredited inspection body is acceptable. Use of a certified product does not preclude the requirement for shop drawings.
11. Re-use of existing hangers: Where pipes are being installed in existing facilities, the re-use of existing hangers at locations of seismic bracing will be judged on a case-by-case basis by the registered project design professional. Unless otherwise shown on the drawings, it shall be assumed that all hangers supporting new piping and located at a seismic brace will be installed new.

E. Ductwork

1. Provide seismic bracing for ducts with cross sectional area greater than 6 square feet (independent of the duct contents) and for ducts containing hazardous materials.
2. Provide supports, braces and anchors to resist gravity and seismic design forces.
3. Design ducts and duct risers to accommodate inter-story drift.
4. Provide independent support for in-line devices weighing more than 20 pounds. Provide independent support and bracing for all in-line devices weighing more than 75 pounds. Unbraced piping attached to braced in-line equipment shall be provided with adequate flexibility to accommodate differential displacements.
5. Appurtenances such as dampers, louvers and diffusers shall be positively attached to the ductwork with mechanical fasteners.

6. Duct supports shall be designed to resist not less than 150 percent of the weight of the duct. For seismic design categories D, E and F, ducts weighing over 10 plf shall not be hung using power driven fasteners.
7. As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an IAS accredited inspection body or otherwise accepted by the Authority Having Jurisdiction is acceptable. Use of a certified product does not preclude the requirement for shop drawings.

F. Tanks

1. Design tank anchorage to resist seismic design force.
2. Design tank legs or supporting structure to resist seismic design force.
3. Provide flexible connections between tank and interconnected piping.

G. Fire suppression equipment and piping

1. See requirements for suspended piping.
2. See requirements for floor-mounted and wall-mounted equipment.
3. Satisfy requirements of NFPA 13 and the force and displacement requirements of ASCE 7. All components shall be UL listed.
4. Provide end of line restraint as required by NFPA 13.

3.11 ELECTRICAL EQUIPMENT

A. Electrical equipment

1. Design equipment to resist seismic design force in any direction.
2. Batteries on racks shall be provided with acid resistant and corrosion resistant wrap-around restraints or shall be otherwise prevented from movement within battery rack. Racks shall be designed to resist seismic design force.
3. Electrical cabinet design shall comply with the applicable National Electrical Manufacturers Association (NEMA) standards.
4. Supports shall be designed to accommodate the seismic relative displacement between points of support.
5. Where equipment is mounted on vibration isolators and restraints, use isolators and restraints designed for amplified code forces and with demonstrated ability to resist required forces including gravity, operational and seismic forces.

B. Conduit, cable tray, bus duct, raceways, bundled cabling

1. Provide supports and anchoring so that, upon application of seismic forces and deformations, conduit/cable tray/bus duct/raceway/bundled cabling will not displace sufficiently to cause damage to wires, connections, adjacent or connecting equipment, building members or finishes.
2. Provide seismic bracing of conduit/cable tray/bus duct/raceway/bundled cabling to resist gravity and seismic design forces.
3. Provide gravity support for conduit/cable tray/bus duct/raceway/bundled cabling that is independent of suspended ceiling framing.
4. Design conduit/cable tray/bus duct/raceway/bundled cabling to accommodate inter-story drift.
5. As an alternate to project-specific design of seismic bracing, use of proprietary restraint systems with a certificate of compliance verified and listed by an accredited inspection body is acceptable. Use of a certified product does not preclude the requirement for shop drawings.
6. Provide flexible connections wherever relative differential movement could damage conduit/cable tray/bus duct/raceway/bundled cabling in an earthquake.

C. Light fixtures

1. Design fixture connections to resist seismic design force.
2. For lights in suspended ceilings:
 - a. For lights weighing 56 pounds or less, provide positive mechanical connection between fixtures and ceiling framing to resist seismic design force and gravity load. Provide two (2) independent wires at diagonally opposite corners connected to structural framing. For lights weighing more than 56 pounds, provide independent support and bracing.
3. For lights in light framed ceilings and walls:

- a. For lights weighing 56 pounds or less, provide positive mechanical connection between the fixture and the ceiling/wall framing capable of resisting required gravity and seismic demands. Provide ceiling and wall framing capable of delivering demands from the light fixture to the structure.
- 4. For pendant mounted fixtures:
 - a. Verify that fixture will not displace in such a manner as to hit adjacent lighting and/or architectural elements or other suspended items. Connection to the structure shall allow a 360 degree range of motion. If pendant fixture could come in contact another item when swinging in a 45 degree arc from vertical in any direction, provide bracing to limit movement and avoid interaction. Design load shall be 1.4 times the operating weight acting down with a simultaneous horizontal load of 1.4 times the operating weight.
- D. Communication systems including alarm systems
 - 1. See requirements for electrical equipment and conduit, cable tray, bus duct, raceways, bundled cabling.

3.12 TRANSPORTATION COMPONENTS

- A. Elevator and escalators
 - 1. Design for conformance with seismic requirements of ASME A17.1.
 - 2. Design to resist seismic design force specified herein. The more stringent design force shall govern.
 - 3. Elevator/escalator equipment and controller supports and attachments shall be designed to resist seismic design force.
 - 4. Elevators travelling with a speed of 150 ft/min or greater shall be provided with a seismic switch in accordance with ASCE 7.
 - 5. Provide retainer plate at the top and bottom of the car and counterweight.

3.13 STORAGE RACKS AND SHELVING

- A. Light duty storage racks and shelving
 - 1. Provide restraint to resist seismic design force in any direction.
 - 2. Where restraint is provided by anchorage to a wall, verify that wall has adequate strength to resist anchor demands. Install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor directly to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.
- B. Industrial storage racks
 - 1. Design for conformance with latest version of Rack Manufacturers Institute (RMI) *Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks* and the seismic design requirements of ASCE 7. Where design criteria conflict, the more stringent shall apply.

3.14 TELEVISIONS, MONITORS

- A. Design support and bracing for wall-mounted and suspended televisions/monitors to resist seismic design force in any direction.
- B. Where restraint is provided by anchorage to a wall, verify that wall has adequate strength to resist anchor demands. Install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor directly to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.
- C. Use mounting brackets certified for resistance to seismic loads.

3.15 DESKTOP COMPUTERS

- A. Provide straps, high friction pads, snubbers or other mechanisms as required to resist seismic design forces.
- B. All connections shall be readily demountable and shall not damage computer housing.

3.16 COMPUTER AND COMMUNICATIONS RACKS, CABINETS AND BOARDS

- A. Design equipment anchorage to resist seismic design force in any direction
- B. Where cable tray is connected to the top of racks or cabinets, design seismic restraint to include the tributary weight of the cable tray and components.
- C. Interconnect adjacent cabinets to cause them to respond together when resisting lateral forces.
- D. Where equipment is supported on raised access flooring, provide bracing and anchorage to the supporting floor below.

3.17 KITCHEN EQUIPMENT

- A. Design equipment anchorage to resist seismic design force in any direction.
- B. Connections shall enable the equipment to be readily disengaged to enable the equipment to be relocated for cleaning.
- C. Provide flexible connections between connected piping and kitchen equipment. If kitchen equipment is restrained with removable "tethers," provide sufficient flexibility in connections to accommodate full range of movement associated with tether.

3.18 SHELF- AND COUNTER-MOUNTED CONTENTS

- A. Provide straps, mechanical barriers, high friction pads, snubbers or other mechanisms as required to resist seismic design forces.
- B. All connections shall be readily demountable and shall not damage or permanently alter contents.
- C. Restraints shall not prevent items from being added to or removed from shelf or counter.

3.19 FIELD QUALITY CONTROL

- A. Owner will engage qualified special inspectors in accordance with Section 014533.
 - 1. Qualifications: The minimum category of special inspector required to perform services outlined below are noted by qualifications in parentheses. The definitions of the categories of special inspector are included in Section 014533.
- B. Coordinate with independent testing and inspecting agency engaged by the Owner to perform field quality control inspection and testing.
 - 1. Provide necessary scaffolding or temporary platforms required by testing agency in order to perform their work. Such scaffolding or platforms shall comply with safety regulations and shall be acceptable to testing agency.
- C. Testing agency shall provide a quality assurance plan as required by ASCE 7, Appendix 11A for installation of the following components and systems per IBC Chapter 17. Confirm the installation of the following complies with details indicated on the Contract Documents and approved shop drawings. A minimum of 3 special inspections shall be performed (pre-construction, mid-construction, and final inspection):
 - 1. Architectural (Structural 1):
 - a. Visually inspect the erection, fastening and anchorage of exterior cladding, veneer and nonbearing walls installed greater than 30 feet in height above grade or a walking surface and/or exterior cladding or veneer weighing more than 5 psf.
 - b. Visually inspect the erection of glass in glazed curtain walls and glazed storefronts for glass installed greater than 30 feet in height above grade or a walking surface.
 - c. Visually inspect the erection, fastening and anchorage of interior veneer and nonbearing walls installed greater than 30 feet in height above grade or a walking surface, interior veneer weighing more than 5 psf and/or interior nonbearing walls weighing more than 15 psf.
 - d. Visually inspect the erection of glass in interior glazed partitions installed greater than 30 feet in height above grade or a walking surface.

- e. Visually inspect the erection and anchorage of suspended ceiling systems. Verify member type and size, verify that bracing elements such as splayed wires and compression struts are installed as detailed; test anchorage to structure.
 - f. Visually inspect the installation and anchorage of steel storage racks greater or equal to 8 feet in height. Verify connections and anchorages of the racks to structure. Spot check the connection of horizontal beams to uprights verifying fastener tightness.
 - g. Visually inspect the installation and anchorage of access floors. Verify connections and anchorages of access floor framing to structure. Verify connection of access floor framing to support posts. Inspect and proof load test installation of post-installed anchors.
2. Mechanical, Electrical and Plumbing (Structural 1):
- a. Visually inspect installation and anchorage of heating, ventilating and air-conditioning (HVAC) ductwork containing hazardous materials or smoke control.
 - b. Visually inspect installation and anchorage of piping systems and mechanical units containing flammable, combustible or highly toxic materials.
 - c. Visually inspect anchorage of electrical equipment used for emergency or standby power systems.
 - d. Visually inspect anchorage of all other electrical equipment.
 - e. Visually inspect installation and anchorage of vibration-isolated systems and associated seismic restraints where indicated on the construction documents or submittals. All restraints require a nominal clearance of 0.25 inch or less between the equipment support frame and restraint.
- D. Special Seismic Certifications (Structural 1):
- 1. Verify that the label, anchorage or mounting conforms to the certificate of compliance for designated seismic systems defined in Section 017325.1.2 and 1.3.
- E. Post-Installed Anchorage Inspection and Testing (Technician II):
- 1. Refer to individual specification sections and/or structural drawings identified in Section 014533 for special inspection and proof load testing of post-installed anchors.
- F. Correct deficiencies in work which inspections and test reports have indicated to be not in compliance with requirements when directed in writing by Architect or Owner.

END OF SECTION

**SECTION 02 41 00
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope: Work under this Section shall include:
1. Provide selective demolition as indicated on the drawings and as required by new construction.
 2. Asbestos and hazardous materials demolition or removal work is not part of this contract.

1.2 SUBMITTALS

- A. Submit for approval selective demolition schedule, including schedule and methods for capping and continuing utility service. Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 7. Means of protection for items to remain and items in path of waste removal from building.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Use experienced workmen.

1.4 PROJECT CONDITIONS

- A. Coordinate all demolition work with Owner, with special attention to noise, dust, debris removal, or other disturbances. Conduct selective demolition so Owner's operations will not be disrupted
- B. Schedule utility shutdowns at least 48 hours in advance. Maintain fire protection services during demolition operations.

- C. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose off site.

PART 2 - PRODUCTS – Not Applicable to this Section

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Do not damage building elements and improvements indicated to remain. Items of salvage value and not included on schedule of salvage items to be returned to Owner may be removed from structure. Storage or sale of items at project site is prohibited.
- B. Do not close or obstruct streets, walkways, driveways or other occupied or used spaces or facilities without the written permission of the Owner and authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.
- C. Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.

3.2 SCHEDULE

- A. Items to be removed from site by Contractor:
- B. Items to remain in place and protected for reuse:
- C. Items to be salvaged for reinstallation in this project:
- D. Items to be salvaged and delivered to Owner:
 - 1. Doors and hardware
 - 2. Toilet accessories
 - 3. Light fixtures
 - 4. Plumbing fixtures
- E. Utilities requiring interruption, capping, or removal.

3.3 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 structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

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.

END OF SECTION 02 41 00

SECTION 02 82 00
ASBESTOS ABATEMENT AND IN-PLACE MANAGEMENT

PART I - GENERAL

1.01 DESCRIPTION

- A. The safe abatement and in-place management of asbestos containing materials (ACM) and presumed asbestos containing materials (PACM) at A/C #9559020 Elevator Upgrade project is the primary purpose of this specification. The contract provisions are designed to protect University community members from exposure as a result of work being performed by the Contractor.

1.02 SCOPE OF WORK

A. Work Included – General

1. The Contractor shall furnish all labor, materials, equipment, services, testing, employee training, fit tests, medical exams, transportation, insurance, and daily expense to meet the requirements of this specification.
2. The Contractor shall obtain all required permits, licenses, registrations, and notifications, and regulatory approvals required by law and UCDMC policy.
3. All asbestos abatement activities associated with this contract shall be performed between the hours of 7:00 AM to 5:00 PM unless coordinated with the University's Representative.
4. The Contractor shall guard against unnecessary disturbances or damage to sensitive finishes on buildings, building systems, and equipment.
5. Any job with more than one class designation (see T8 CCR 1529) shall be performed at the higher standard. For example, a contract let for class II and class III work will be performed at the class II level.

B. Work Included – Specific

1. This project consists of impact to elevators located at the East Wing and at the University Tower. Asbestos has been identified in both wings of the hospital and will be impacted by the project. The project includes impact to asbestos containing materials and will impact components with lead in the paint. The Contractor is responsible for identifying the exact locations and number of work areas listed below by referring to University supplied project drawings and by working with the University's Representative.
2. The East Wing has been tested for asbestos containing materials by various independent asbestos consultants. Asbestos materials have been identified in the project area and may be impacted by the planned project. See Section 1.03 Site Characterization and the table identifying the different asbestos materials present in the project area. It is the responsibility of the contractor to know which materials have been identified to contain asbestos, which might be impacted by the scope of work.

3. Asbestos Abatement Overview – This project includes removal of asbestos containing fireproofing materials in spot locations for seismic support and other attachments. In the East Wing, there is asbestos containing fireproofing present throughout the underside of the roof deck with considerable amount of fireproofing debris on top of the plaster ceiling system and within the interstitial cavities between all plaster walls. Due to the asbestos contamination assumed to be present on top of plaster ceilings and assumed to be present within the open top plaster wall cavities, all wall and ceiling materials within the East Wing are considered as asbestos containing materials. In addition, all ducts, insulation, electrical wiring, piping, conduit, electrical wiring, etc., located in the attic space are considered contaminated with asbestos.
4. The elevator shafts of East Wing Elevator #1/2, [and University Tower Elevators #11/12, #13/14 and #15] were tested for asbestos and no asbestos was detected in the plaster or settled dust associated with the East Wing Elevator shaft [and no asbestos was detected in the drywall and joint compound at walls or in the fireproofing in the University Tower Elevator shafts].
5. The project includes removal of partial ceilings to allow access of personnel and materials into the attic space to conduct the work required. Small amounts of the fireproofing will need to be removed for anchoring seismic braces and other attachments. This project will require a licensed asbestos contractor registered with DOSH to perform removal of all selected asbestos containing materials and asbestos contaminated materials within work environments in accordance with Title 8 1529 Asbestos in Construction in order to accomplish the tasks.
5. It is anticipated work might be required in asbestos contaminated attic space of the East Wing by other non-asbestos abatement trade workers, including but not limited to, electricians, plumbers and other trades. This will require trades that are trained in asbestos and respiratory protection to work in asbestos contaminated work environments to perform this work.
6. In-Place Management of Asbestos - Asbestos materials will be left in place in other areas of the building on this project that will include the fireproofing, floor tiles and mastic, wall plaster systems that are known to have asbestos debris within the cavities, many plaster ceilings with asbestos containing fireproofing debris throughout the attic spaces that will not be cleaned. Since the attic space above the ceiling system of the East Wing is considered asbestos contaminated, if access is required to accomplish the scope of work, asbestos training, worker protection, air sampling, decontamination, engineering controls, and other control measures apply for all contractor employees who are required to enter the attic space or who work in areas with asbestos containing materials.
7. Work practices and procedures for asbestos removal are provided in these specifications.
8. In locations where there has been removal of spot areas of asbestos fireproofing for attachments, the asbestos contractor will be responsible for replacement of the fireproofing materials. The new fireproofing materials shall be hand packed by the asbestos contractor. See other specifications regarding materials, execution and performances for this required work.

9. The asbestos contractor will be responsible for soft demolition of items from the work area to minimize potential disturbance to asbestos materials.

1.03 SITE CHARACTERIZATION

- A. An asbestos inspection has been conducted by the University or the University's Representative's Hazardous Materials Consultant who is a California Certified Asbestos Consultant. Materials found or presumed to contain asbestos at this job site are listed in the table below. The table below does not suggest all of the materials are to be removed. It is provided to inform the contractor on all asbestos containing materials that have been identified in the project area that the contractor will be working near and around during execution of the project.

Asbestos Containing Materials in East Wing					
Building Description	System	NESHAP Class	Cal/OSHA Class I, II, or III	% of Asbestos	Location
Fireproofing		RACM	I	10	See Drawings
Pipe Insulation		RACM	I	20	See Drawings
Drywall and Joint Compound		RACM	I	Assumed > 1%	See Drawings
Wall Plaster Cavities		RACM	I	Assumed > 1%	See Drawings
Ceiling Plaster Spaces		RACM	I	Assumed > 1%	See Drawings
Duct Insulation in attic and chases contaminated		RACM	I	Assumed > 1%	See Drawings
Electrical Wiring contaminated		Cat II	II	Assumed > 1%	See Drawings
Piping and Conduit in attic and wall spaces contaminated		Cat II	II	Assumed > 1%	See Drawings
9" or 12" Floor Tiles & Mastic		Cat I	II	Assumed > 1% for Tiles and Mastic	See Drawings
Transite Pipes		Cat II	II	Assumed > 1%	See Drawings

Transite Material Sandwiched between Metal Ventilator Units at Perimeter Walls of Patient Rooms	Cat II	II	Assumed > 1%	See Drawings
Asbestos Containing Materials in University Tower				
Black Mastic Associated with Flooring Systems	Cat II	II	1-5% Chrysotile	See Drawings

1. The asbestos inspection report prepared by MACTEC Engineering and Consulting, Inc., November 29, 2005 is available upon request. This inspection report includes an assessment for hazardous materials including asbestos, lead in paint, fluorescent light tubes and ballasts containing PCB's. The contractor shall refer to this inspection report for locations where asbestos has been identified in the East Wing.
2. Where "See Drawings" is noted in the above table or elsewhere in this specification; reference drawings identified in the Sheet Index for Location.

- B. Non-asbestos containing materials have been identified and sampled for this project. The table below includes a list of materials sampled and found not to contain asbestos. If the Contractor discovers building materials on the project not included in either Table A (Asbestos Containing List) or Table B (Non-asbestos Containing List) the Contractor shall bring this to the attention of the Project Manager, which may result in asbestos sampling by the University's Certified Asbestos Consultant.

Building Materials Sampled and Found Not to Contain Asbestos – East Wing	
Material Description	Location
Acoustic Ceiling Panels ¹ (2'x2" and 2'x3')	Various Locations
Acoustic Ceiling Tiles (12"x12") ¹ with Mastic	Various Locations
Base Cove mastic (4" and 6")	Various Locations
Window Putty (Glazing)	Various Locations
Sink Undercoat (Black)	Various Locations
Plaster Walls and Ceilings	Various Locations including in the Elevators #1 & #2 Shaft
Stucco	Various Locations
Terrazzo Flooring	Various Locations
Ventilation Duct Seam Tape	Various Locations
Concrete	Various Locations

Building Materials Sampled and Found Not to Contain Asbestos – University Tower

No asbestos has been found in many asbestos inspections in the University Tower except for the black mastic associated with flooring systems. All other suspect building materials sampled throughout the University Tower have been negative for asbestos, consistent with the age of the building (circa 1982).

¹ Materials that are contiguous with the attic space of the East Wing are assumed to be contaminated with asbestos on the top surfaces. Although the building material (acoustical ceiling panels and 12" acoustical ceiling tiles) may not contain asbestos, the top surfaces of these are assumed to be contaminated with asbestos fireproofing debris.

- C. Hazardous materials, other than ACM/PACM that have the potential to be disturbed at this job site are listed in the table below:

1.04

Material Description	Type of Hazard	Quantity (approx.)
Fluorescent Light Bulbs	Mercury	See Drawings
Light Ballasts	PCB's	See Drawings
Light Ballasts	Universal Waste	See Drawings
Mold Contamination	Mold	Undetermined
Thermostat Switches	Mercury	See Drawings
Exit Signs	Radioactive Gas Tritium	See Drawings
Painted Surfaces & Ceramic Products	Lead in Paint and Glaze	See 02 83 00

- The Contractor shall review non-asbestos hazardous material required protocols with the University's Representative and the EH&S Representative. Lead related work will be addressed in Section 02 83 00 specifications, if applicable.
- Where "See Drawings" is noted in the above table or elsewhere in this specification; reference drawings identified in the Sheet Index for Location.

1.05 JOB WALK PROTOCOL

- A. No special provisions are required on the job walk to review the asbestos materials, since there are no areas of known asbestos contamination on this project which the contractor will have to access for the job walk.
- B. The pre-bid job walk will not include access into the attic space; however, if a bidder desires to include an inspection of contaminated areas cited in 1.02.A or 1.02.B, the contractor is required to wear respirators and protective clothing per CCR, Title 8 1529. Prior to entering contaminated areas, the bidder must show proof of (1) AHERA or asbestos awareness training and (2) a respirator fit test within the past 12 months.
- C. For access into attic spaces in project areas identified with known asbestos containing fireproofing materials, a controlled access will be required by Contractors who desire to look or inspect the attic spaces. Access will require a controlled mini-enclosure to minimize potential asbestos contamination into the space below the ceiling system.
- D. Short Duration Access into the Attic Space (30 minutes/day) – Mini-enclosure
 - 1. Entry protocols - Put on respirator, perform negative pressure and positive pressure fit tests. Put on a disposable coverall (over street clothes) and enter the mini-enclosure to view the contaminated space from a ladder.
 - 2. Exit protocol - Take off the disposable coverall and place into the asbestos waste bag located inside of the mini-enclosure. Wet wipe exposed skin with wet wipes or wet clean clothes and place into waste bag. While still wearing the respirator exit the mini-enclosure. Remove the respirator outside of the mini-enclosure and tape opening to respirator filters. Wet wipe the respirator, hands and face, and place wet wipes into waste bag.
- E. Long Duration Access (>30 minutes/day) -
 - 1. Not Available unless by special request.

1.06 ABBREVIATIONS AND DEFINITIONS

A. Abbreviations

- 1. ACM: Asbestos Containing Material
- 2. AHERA: Asbestos Hazard Emergency Response Act
- 3. CARB: California Air Resources Board
- 4. CSLB: Contractor's State Licensing Board
- 5. CDPH: California Department of Public Health
- 6. DOP: Dispersed Oil Particulate
- 7. DOSH: Division of Occupational Safety and Health (Cal/OSHA)
- 8. ELAP: Environmental Laboratory Accreditation Program
- 9. EH&S: UCDMC Department of Environmental Health & Safety
- 10. NEA: Negative Exposure Assessment
- 11. NPE: Negative Pressure Enclosure
- 12. NVLAP: National Voluntary Laboratory Accreditation Program
- 13. PACM: Presumed Asbestos Containing Material
- 14. RACM: Regulated Asbestos Containing Material
- 15. TSI: Thermal System Insulation

16. University or University of California Davis Medical Center (UCDMC), or Owner shall be considered the same entity when used in these specifications.

B. Definitions: The following definitions are provided for additional clarification to the California Code of Regulations (CCR), Title 8, 1529 and the Sacramento Metropolitan Air Quality Management District (SMAQMD) Rule 902.

1. ACM and PACM are defined in 8 CCR 1529; which includes friable and non-friable asbestos. These regulations include the use of worker protection, negative pressure enclosures (NPE), air monitoring, etc.
2. Ambient Air Quality refers to the quality of local air conditions prior to the commencement of asbestos related work.
3. Per T8 CCR 1529, Class I asbestos work involves the removal (abatement) of TSI or Surfacing material when (1) more than one glove bag is used or (2) removal of TSI or Surfacing material consisting of more than one 60" X 60" waste bag.
4. Per T8 CCR 1529, Class II asbestos work involves the removal (abatement) of non-TSI or non-surfacing material if the work is not repair or maintenance as defined by Class III. Examples of Class II work include removal of floor tile, floor mastics, gypsum wallboard with joint compound, roofing and siding shingles, construction mastics, etc.
5. Per T8 CCR 1529, Class III asbestos work involves repair and maintenance of friable ACM/PACM that is either TSI or Surfacing materials, but does not exceed the removal of ACM/PACM that exceeds either one glove bag or one 60" x 60" disposal waste bag.
6. Per T8 CCR 1529, Class IV asbestos work refers to contact but no disturbance of ACM/PACM. Class IV work refers to clean-up operations of Class I, II, or III projects. Class IV work does not refer to incidental contact by maintenance workers (see 8 CCR 5208 for custodial/maintenance workers guidelines).
7. Negative Pressure Enclosure (NPE) refers to full containment and mini-containments under negative pressure with HEPA filtered exhaust.

1.07 SUBMITTALS

A. The submittals listed in 1.06 B must be completed and accepted by the University's Representative with the concurrence of the EH&S Representative prior to the contractor beginning any work.

B. List of Submittals:

1. References to include three projects of similar scope and size.
2. Notifications to Cal/OSHA and Sacramento Metropolitan AQMD (if applicable).
3. Permits if applicable (federal, state, local, or UCDMC).
4. Current certificates of AHERA Asbestos Training for Workers and Supervisors. See Section 3.07.
5. Copies of all asbestos training and respiratory training for various Trade workers who will be working in the contaminated work spaces. See Section 3.07.
6. Current respiratory fit test records (within past 12 months) for all workers required

- to wear a respirator.
7. Physician's certificates of medical fitness for respiratory use for all workers wearing a respirator and medical evaluation for asbestos related work (within 12 months) for all asbestos abatement workers.
 8. DOSH Registration for asbestos related work.
 9. DOP certificates for all HEPA vacuums and negative air machines, which are required to be tested onsite and witnessed by UCDHS EH&S or the University's Asbestos Consultant. Submit after equipment has arrived on campus and has been tested. Provide information of the company providing the DOP challenge testing of the HEPA filter systems showing proficiency in the testing. Include evidence of the training of personnel conducting the challenge testing.
 10. List of HEPA vacuums and negative air machines to be used on the project (mfg. model and serial numbers).
 11. Safety Data Sheets for all products used at the job site.
 12. List all laboratories used by Contractor for air or bulk samples. Provide proof of current AIHA Proficiency Analytical Testing (PAT) Program with passing scores.
 13. California Contractor's License C22 for asbestos.
 14. Waste Disposal Plan including name of disposal site, waste transporter, and waste transporter certification.
 15. Substitute Materials Information (for any material not listed in 2.01).
 16. General liability insurance certificate with Owner and asbestos consultant named as additional insured.
 17. Auto insurance certificate.
 18. Workers Compensation Insurance certificate.
 19. Written work plan including schedule, emergency plans, route of waste transport from project site to waste bin.
 20. Manufacturer's documentation of 5.0 micron filter that shall be used for filtration of all water from the shower and other asbestos related work.

1.08 CONTRACTOR QUALIFICATIONS

- A. The contractor performing asbestos abatement work shall be currently licensed as an Asbestos Contractor (C22) with the California Contractor's Licensing Board.
- B. The contractor performing asbestos abatement work shall be currently registered for asbestos with the California Department of Industrial Relations, Division of Occupational Safety and Health (DOSH).
- C. The contractor's personnel performing asbestos abatement work shall meet the following training requirements:
 1. Class I and II Asbestos Work: Supervisors and Workers must be AHERA trained and shall have current refresher training certificates for asbestos related work.
 2. Class III Asbestos Work: Supervisors and Workers shall have received at least 16 hours of asbestos training. Depending upon the work trade such as electricians, plumbers, carpenters, etc., the number of hours of asbestos training may be less than 16 hours, if these trades are not involved in asbestos removal activity. Trade work involving this class of workers may only require a minimum

of 6-8 hours of asbestos training for Class III work where they are working in asbestos contaminated work spaces, drilling holes in materials containing asbestos for conduit or pipe installation, attaching to building surfaces conduit, or other minor disturbance to asbestos materials, but not involved in actual removal of asbestos. Removal of small amounts of asbestos such as fireproofing for attachment of hangers for electrical, plumbing or other utilities would require a higher level of training (Class I). All class I work shall be performed by a licensed asbestos contractor.

1.09 REGULATIONS

A. The contractor performing asbestos abatement work shall comply with applicable federal, state, local, and University laws and regulations. The list of regulators and regulations, cited below, is not meant to be comprehensive, but to serve as reference for the most commonly used standards:

1. FEDERAL

a. EPA

- 1) 40 CFR, Part 763, Subpart E – AHERA

b. OSHA

- 1) 29 CFR 1926.1101 - Construction Standard
- 2) 29 CFR 1910.1001 - General Industry Standard
- 3) 29 CFR 1910.147 - Lock Out - Tag Out

c. NESHAP

- 1) 40 CFR 61, Subpart M - Asbestos Emissions
- 2) 40 CFR 61, Subpart A

d. DOT - Regulations

2. STATE

a. Cal/OSHA

- 1) CCR, Title 8, Section 1529 – Asbestos Construction Standard
- 2) CCR, Title 8, Section 3203 - Injury Illness Prevention
- 3) CCR, Title 8, Section 5194 - Hazard Communication
- 4) CCR, Title 8, Section 5157 - Confined Space
- 5) CCR, Title 8, Section 5208 - General Industry Standard
- 6) CCR, Title 8, Section 5144 – Respiratory Protection Standard

3. LOCAL

a. Sacramento Metropolitan Air Quality Management District (SMAQMD)

- 1) Rule 902

4. UC DMC

a. Policy and Procedures

1.10 NOTIFICATION AND PERMITS

- A. Contractor is responsible for notifying federal, state, local agencies, obtaining all required permits/extensions, and bearing all related costs. Contractor shall provide a copy of all notifications and permits to the UCDMC Representative prior to the start of the work and during the project if additional notifications or permits are obtained.
- B. UCDMC
1. Hot or Hazardous Material Permit (Call the UCDMC Fire Department at 916-734-3060 for instructions).
 2. EH&S Waste Manifest Protocols (Call EH&S Representative, at 916-734-2740 for instructions). Only EH&S staff will be allowed to sign Waste Manifests.
- C. Sacramento Metropolitan Air Quality Management District
1. Provide ten (10) days notification to Sacramento Metropolitan Air Quality Management District (SMAQMD) for any demolition or renovation job with RACM, or materials that will become RACM which exceeds a combined amount of 260 linear feet, 160 square feet or 35 cubic feet.
- D. NESHAP
1. The US EPA NESHAP has jurisdiction on UCDMC projects located outside of Sacramento County; therefore, notification to NESHAP and CARB is required on projects outside of Sacramento County. This project is in Sacramento County; therefore, the NESHAP regulations do not apply.
- E. CAL/OSHA
1. Only DOSH registered contractors are permitted to perform class I, II, and III work at UCDMC where removal of asbestos is required. Contractor trades such as electricians, carpenters, plumbers, etc., who have received Class III asbestos training due to the potential for disturbance of asbestos materials are not required to be registered with Cal/OSHA if they are not removing asbestos materials. Drilling holes or attachments to building surfaces that might contain asbestos (such as gypsum wallboard or plaster systems) or accessing an asbestos contaminated work area for example is not considered asbestos removal. Removal of small amounts of fireproofing for attachment and support hangers (if required for the project) shall be performed by a licensed asbestos contractor. Contractor shall provide written notification to the local Cal/OSHA office 24 hours prior to the start of work.

1.11 UNIVERSITY CONTACTS

- A. University's Representative: Jim Davis
- Phone: 916-734-4702
- FAX: 916-734-7751

B. EH&S Representative: Kaila Benton-Vitz

Phone: 916-734-2740

FAX: 916-734-7360

C. University's Representative's Asbestos Consultant: Rick Beall (Entek Consulting Group, Inc.)

Phone: 916-632-6800

FAX: 916-632-6812

PART II - MATERIALS AND EQUIPMENT

2.01 MATERIALS

A. Safety Data Sheets (SDS)

1. As specified in the Cal/OSHA Hazard Communication standard (Title 8 5194), the Contractor shall provide safety data sheets (SDS) for all products they use on UCDMC campus. The SDS files shall be submitted prior to the start of the project and shall be located in or near the job site entrance.

B. Surfactants

1. Contractor may use Foster 32-90, Certane 2075, or equal, for amended water applications. The Foster product is manufactured by H.B. Fuller Co., Foster Products Corporation, Oakdale, MN. The Certane product is manufactured by Certech, Eden Prairie, MN.

C. Encapsulants

1. The following products or their equals are to be applied using a brush, roller or an airless sprayer, when an encapsulant is required on the project. Contractor shall follow strict manufacturer instructions regarding surface preparation, ambient air retractions, depth of penetration or recommended thickness (dry), and curing time.
 - a. For penetrating & lockdown purposes use Foster 32-60 or Certane 909, or equal.
 - b. For bridging purposes use Foster 32-32 or Certane 2000, or equal.
 - c. For high temperature applications, e.g., steam pipes, use Foster 84-18 or Certane 1000, or equal.
2. Any proposed equal to the products listed above must meet the following criteria: Submit product information prior to the start of the job and receive approval by the University's Representative with the concurrence of the EH&S Representative; non-toxic and non-irritating as defined by the Hazardous Substance Control Act; sufficiently tinted to provide contrast with the material being coated; and have a minimum 60 lbs./inch Batelle Standard impact rating.

3. All products will be rated UL Class A and have a flame resistance/spread rate less than or equal to 25 as designated by the ASTM code E 162.

D. Polyethylene Bags and Sheeting

1. Bags and sheeting used for capturing asbestos waste are required to be (1) six mil thick and (2) meet the following standards: UL Standard No. 263, ASTM E-84, NFPA Standard 701 & 255; and have a flame resistance/spread rate less than or equal to 25 ASTM (E-162).
2. Startex Corp.(Lakeville, MN), North Plastics (Cottage Grove, MN) Bermis Co. (Terre Haute, IN) provide acceptable bags and sheeting. If an equal is proposed, comply with the provisions in 2.1 C 2 above.
3. The contractor will ensure all asbestos waste is properly labeled per Cal EPA, DOT, Cal/OSHA, and EH&S standards prior to disposal.

E. Adhesive Removers

1. All adhesive removers shall meet the Hazardous Substance Control Act standards for non-toxic, low odor, and non-irritating properties.
2. All adhesive removers shall be (a) non-flammable and (b) contain less than 1% (by volume) of any chlorinated hydrocarbon solvents.
3. Whenever possible, adhesive removers shall be mixed into a slurry/paste using diatomaceous earth to control migration through the substrate. This requirement especially applies where there are existing building spaces below the project area.

2.02 EQUIPMENT

- A. All HEPA filtered vacuums and HEPA filtered negative air machines shall pass a leak (challenge) test on-site by a firm independent of the contractor before they are allowed to be used on the project. The challenge testing must be witnessed by the UCDHS EH&S or the University's Representative Asbestos Consultant.
- B. Tools and equipment shall arrive at the job site free of significant visible debris and dust. No ACM debris shall be allowed to be brought onto the site at any time. All vacuum ports and other openings to negative air units shall be sealed when the units arrive on the project site and sealed when they leave the project site. The Owner or Owners' Representative reserves the right to reject any equipment brought onsite by the asbestos contractor that is deemed contaminated with suspect asbestos materials from a prior project.
- C. All electric tools and equipment shall be connected to a GFCI when in use.

PART III - EXECUTION

3.01 SAFETY MEETING

- A. In accordance with State and Federal laws, the Contractor is responsible for conditions of the project site, including the safety of all persons and property during the performance of the work. To ensure effective communications in safety matters, the Contractor shall

participate and conduct the following meetings:

1. Pre-construction safety meetings may include representatives from the following groups: FD&C, Infection Prevention, EH&S, affected building occupants, general contractor, asbestos subcontractors (if applicable), and the UCDMC Hazardous Materials Representative. The following subjects will be discussed: impact to building occupants, waste disposal, ICRA Permit and compliance, and work related safety programs.
2. On the first day of work, Contractor shall conduct a safety meeting for its employees which alerts them to the specific hazards of the job. The Contractor shall conduct the safety meetings in primary language of its employees.
3. Contractor shall conduct a safety meetings with its employees during the course of the project to discuss health and safety issues related to the project.

3.02 WORK SITE PREPARATION

- A. Prior to beginning any on-site work preparation, Contractor shall walk the job area with the UCDMC Project Manager and with the UCDMC Representative Asbestos Consultant to discuss site characterization, ICRA Permit and compliance, regulated area set-up, access controls, security, and safety issues. The contractor is responsible for providing locks and security to the project site to prevent the public and other hospital staff from entering the project area during work hours and during off work hours.
- B. Post all regulatory notices, permits, sign in/out roster at the primary entrance to the job site.
- C. Contractor, in coordination with the University's PO&M, shall ensure all electrical and HVAC equipment servicing the work area is disconnected and locked out, when possible. Electrical tools in the work zone shall be connected to a ground-fault circuit interrupter (GFCI).
- D. The contractor shall seal air tight all HVAC supply and return registers, exhaust registers and other critical openings with tape, double layers of plastic and cardboard or plywood inserts as necessary.
- E. Contractor shall ensure all negative air machines and HEPA vacuums are delivered to the site clean and sealed.
- F. Contractor shall ensure all HEPA filtration units are challenge leak tested on site and witnessed by EH&S. Each piece of equipment shall be tested in compliance with the ANSI Z9.9 Standard (trapping and retaining 99.97% of all particles challenged with 0.3 micron diameter particles). The asbestos contractor shall provide copies of the challenge tests for all HEPA filtered systems showing proof of passing the challenge test. All HEPA filtered systems shall have a sticker applied to the surface showing passage of the challenge test. The company performing the challenge test procedure shall show evidence of proficiency and training in the test procedure that will be used.
- G. In order for the UCDMC Project Manager to conduct timely inspections, Contractor is obligated to inform the UCDMC Project Manager and the UCDMC Representative Asbestos Consultant when they are ready to be inspected at least 24 hours prior to the

requested inspection.

- H. All Cal/OSHA Class I, II, and III asbestos work shall be conducted within a regulated area per 8 CCR 1529.
- I. Temporary anterooms shall be erected at entrance/exist areas from the construction work. The anterooms shall be sized to accommodate equipment and materials being introduced and waste materials being removed from the construction work area. The plastic separation walls shall be constructed with zippered doors at the entry points. At least one recording manometer shall be installed at the entrance to the anteroom to monitor the negative pressure within the construction work area.
- J. Where there is work in the attic space, loss of negative pressure will occur when the ceiling system is opened up. To meet the requirement for -0.020" water column negative pressure within the anteroom compared to the surrounding non-construction work area, the following configuration is required when access into the attic space is required.
 - 1. Two anterooms shall be erected inside of the space, attached together with zippered doors.
 - 2. The first anteroom is the main entry from the public access or non-construction zone. It will allow access into the second anteroom that is attached to the opened ceiling leading to the attic space. A manometer shall be attached to this first anteroom. A flexible duct shall be attached to this first anteroom from a HEPA filtered negative air unit to create a minimum -0.020" water column negative pressure in the first anteroom.
 - 3. The second anteroom is attached to the first anteroom by means of a zippered door. Access into the attic space shall be through this second anteroom. The opening into the attic space shall be sized according to dimensions prescribed by the Owner. A flexible duct shall be attached to this second anteroom from a HEPA filtered negative air unit to create negative pressure from the first anteroom.
 - 4. To accomplish the above negative pressure requirements, the contractor may use one large negative air unit and split the intake duct into two smaller flexible ducts attached to the two anterooms. The second anteroom shall have the greater amount of air exhausting from this space compared to the first anteroom by adjusting the exhaust volume, since it is undesirable to draw air from the dirty space (second anteroom) into the cleaner space (first anteroom). Use of small variable speed HEPA filtered negative air units approximately 600-1000 cfm in size are the most effective means of meeting these pressure requirements.
 - 5. To facilitate air pressure in the two anterooms, the contractor shall seal the opening to the attic space using a hard lid to partially cover the opening for the majority of the time unless materials and personnel are entering/exiting the attic space. The hard lid can be a material that is acceptable to the Fire Marshall and is simply intended on being placed on top of the opening to the attic space to close off the access opening in order to increase negative pressure in the two anterooms below.
 - 6. The negative air units shall be exhausted outside of the building via windows or other locations where the exhaust can be outside the building envelope.
 - 7. When it is not feasible to exhaust air from the work area out of the building, the

contractor shall exhaust the HEPA filtered negative air units into a location deemed acceptable by the Project Manager. The exhaust of the negative air unit may be required to be exhausted into a diffusion chamber constructed with pleated filters making up the diffusion chamber to equality disperse the exhaust air in a broad pattern. This approach is to minimize a high velocity exhaust into occupied areas of the hospital.

3.03 WORK SITE CONTROL

- A. Contractor shall restrict the work areas to authorized, trained and protected personnel; including, the Contractor's employees, University Representatives, and state agency representatives.
- B. At regulated job sites, the Contractor shall use plastic barriers to demarcate the boundary of the work zone and post on the interior door a warning sign as required by 8 CCR 1529:

DANGER

ASBESTOS

MAY CAUSE CANCER

CAUSES DAMAGE TO LUNGS

AUTHORIZED PERSONNEL ONLY

**WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS
AREA**

- C. All unauthorized personnel are to remain outside the regulated area. Contractor is to call the University's Representative or the Project Manager if unauthorized personnel enter the regulated area and do not leave upon request by the Contractor.
- D. If inclement weather threatens the job site, Contractor shall take all necessary measures to ensure asbestos contaminated debris does not migrate from the regulated areas.
- E. If wind speed threatens the job site, Contractor shall erect a wind barrier or suspend operations until the wind is below 15 mph.

3.04 RECORD KEEPING

- A. Contractor shall maintain the following records at the regulated work area:
 - 1. Site Log (sign-in/sign-out for all people entering the containment).
 - 2. Incident Log & Emergency Action Plan.
 - 3. Personal air sampling results including chain of custody forms and laboratory analysis.
 - 4. Laboratory results from area samples collected inside and outside the regulated area.
 - 5. Asbestos supervisor and worker training certificates, current respirator fit tests, current medical clearance certificates.

6. All applicable notifications, including, but not limited to SMAQMD and Cal/OSHA and any revised notifications during the course of the project.
 7. Copies of all Safety Data Sheets for materials present or used on the project.
- B. The UCDMC Representative's shall retain all records of samples related to the project and report results in the closeout documentation to be submitted at the end of the project.

3.05 ADMINISTRATIVE CONTROLS

- A. Asbestos work will be performed after normal working hours (Monday-Friday, 7:00 AM to 5:00 PM), unless otherwise agreed with the Project Manager.
- B. Construction work performed in high heat environments requires the Contractor to provide sufficient breaks and drinking water to maintain a safe work environment and to reduce the potential for heat stress.
- C. Contractor shall clean the work site before all breaks and at the end of the shift. Asbestos containing materials and debris shall be HEPA vacuumed daily to maintain a clean work area. At least one HEPA vacuum shall remain inside of the work area every day and available for use during work activities.
- D. During the removal process for class I, II and III asbestos work, an AHERA trained Contractor/Supervisor must be on-site. During work in asbestos contaminated attic spaces, an asbestos Competent Person, as defined by T8 CCR 1529, shall be present at all times to oversee safe access and control measures.

3.06 ENGINEERING CONTROLS

- A. Negative Pressure Enclosure (NPE)
 1. See Section 3.02 describing the required negative air unit configuration to meet the Cal/OSHA requirements for asbestos related work, which requires a minimum -0.020" water column negative pressure between the work area and the surrounding space.
 2. A negative pressure enclosure is required when asbestos containing materials are being removed or disturbed on this project site. There will be multiple locations where negative pressure work environments will be required for asbestos abatement. Refer to the drawings and other specifications for locations.
 3. There are two types of negative pressure enclosures: full containment and mini-containment. Both containments require proper warning signs in accordance with Cal/OSHA to establish a restricted asbestos regulated area.
 4. Full containment for asbestos related work requires the contractor to comply with all provisions in CCR, 8, 1529 and SMAQMD Rule 902. The following items are provided as a reminder of key elements and is not meant to be comprehensive: two layers of six-mil polyethylene on floors, two layers of four-mil polyethylene on walls, three stage decontamination unit with shower, sufficient negative pressure to maintain at least -0.020" of water column pressure differential, clear viewing ports, recording manometer, fire extinguishers, and emergency response protocols.
 5. Where removal of the asbestos containing fireproofing is required in spot

locations for installation of seismic bracing, and attachment of other mechanical or electrical/piping support, the spot abatement of fireproofing materials, ceiling systems and other asbestos contaminated materials shall be performed only by the asbestos contractor. Fireproofing shall be wetted continuously with water and a wetting agent and removed slowly by a team of at least two employees, capturing the fireproofing into waste containers or pans held up to the underside of the area being abated.

6. The construction of a mini-containment for asbestos work requires at least one layer of six mil polyethylene with zippered doors to restrict airflow and a HEPA filtered vacuum. A negative air unit shall be attached to the mini-containment to maintain negative pressure inside the mini-containment. Comply with all mini-containment requirements as stated in Title 8 CCR 1529. Mini-containments shall have zippers on the enclosure to allow access to attic spaces, walls or subfloor spaces. Only zippered type partitions will be allowed. The older method of flapped plastic entries will not be accepted.
7. Asbestos related work requiring glove bags to remove asbestos shall comply with the provisions in 8 CCR 1529. The type of glove bag must correspond to the type of activity, e.g., angle glove bags for curved pipe sections, vertical glove bags for vertical pipe, etc. Glove bags must be smoke tested after installed by the Contractor prior to removing asbestos to assure they do not leak. All glove bag work requires at least two people working together as required in Title 8 1529.
8. An Infection Control Risk Assessment (ICRA) Permit will be developed for this project by the University's Representative and approved by the Medical Center's Infection Prevention with oversight by EH&S. Depending upon the location of the work and the potential for dust generation that could impact patient care, the ICRA may require more stringent controls than those described under this specification. Adequacy of controls may be verified by periodic airborne particle counting, conducted by EH&S or by a representative of the owner. Contractor understands that any operations generating particles in excess of particle count requirements will require the Contractor to modify the project site engineering controls and work practices. Contractor is responsible for maintaining engineering controls and work practices so excessive airborne particulate is not released.
9. Sticky mats are required to be present in the decontamination unit (first anteroom) and immediately outside of the first anteroom in the non-construction work area. The sticky mats shall be changed on a daily basis to keep them effective at cleaning the soles of the shoes. The sticky mats are a requirement of the ICRA Permit for the duration of the project through completion of all new construction. They will be required through final detail cleaning or final terminal cleaning for each space the construction work activity has impacted.

B. Wet Methods

1. Prior to removing ACM/PACM, the contractor shall adequately wet the material with water that may have an approved surfactant added. Once removed, the waste must be kept wet until it is placed into six-mil asbestos labeled bags. Asbestos debris generated during the project shall remain wetted at all times until

the waste debris is sealed into waste bags.

3.07 WORKER PROTECTION

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

1. Respiratory Protection

- a. Respiratory protection shall be provided to all Contractor employees where there is the potential for exposure to asbestos at or above the permissible exposure limit. In addition, all work in the attic spaces where there is asbestos containing fireproofing or other asbestos debris, will require workers to wear respirators. Respiratory protection shall be provided at no cost to the Contractor's employees per 8 CCR 1529 and 5144.
- b. At a minimum, half-face respirators with P-100 (HEPA) filters shall be provided to all employees required to work inside of the asbestos contaminated spaces. Employers shall provide full-face powered air purifying (PAPR) or full hood type respirators to those employees who request one at no additional cost to the employee pursuant to 8 CCR 1529. If personal air sampling of specific work practices identify asbestos exposures above the protection factor of a half-face respirator, the contractor will be required to go to a higher level of protection which will include the use of a tight fitting full-face powered air purifying respirator.
- c. If personal air samples exceed the protection factor of the respirator, work shall stop for that trade contractor performing the work. Engineering controls and work practices shall be evaluated by the UCDMC Asbestos Consultant to determine reasons for the elevated exposures. Changes to work practices and engineering controls will be required in order for the contractor to begin work again, in addition to the requirement for those employees to wear full-face PAPRs.
- d. The asbestos abatement workers shall wear full-face powered air purifying respirators (PAPRs) during removal of fireproofing, ceiling plaster, and other mechanical systems and electrical equipment that is contaminated with asbestos. The contractor shall use the manufacturer's flow meter every day for all respirators at the start of the day and after break periods to make sure the air flow into the PAPRs meet the minimum air flow into the face piece.
- e. Contractor asbestos employees who wear a respirator shall have passed a respirator fit test within the previous 12 months to perform work on the project. All workers required to wear a tight fitting respirator shall be clean shaven and not have any facial hair interfering or contacting the seal of the respirator with the worker's face. Workers who are observed inside of the asbestos contaminated work area with facial hair contacting the respirator seal will be asked to immediately leave the work area and shall not be allowed to return until clean shaven and a new respirator fit test has been provided and the individual passes.

2. Protective Clothing

- a. Workers shall be provided with sufficient sets of protective clothing

whenever there is potential exposure to asbestos dust at or above the permissible exposure limit. Tyvek, Kleenguard coveralls, or an equal with attached hood and foot coverings are required. The coveralls shall be available at no cost to the Contractor's employees, UCDMC consultants, and state officials. Disposable coveralls shall be replaced or repaired when they rip or tear or become damaged to the point where they are not providing protection to the worker. At no time shall workers performing work in an asbestos contaminated work area leave the containment while wearing the disposable coverall. The coverall shall be removed inside of the mini-enclosure or work containment prior to the worker exiting the enclosure.

- b. At no time shall workers be allowed to leave the general construction work area in work shoes tracking out dust onto the floor. The ante room shall be used to clean shoes before entering into the adjacent corridors. The sticky mats shall be changed at sufficient frequency and at least daily to minimize tracking out dust outside of the construction work area.
- c. Contractor shall provide rubber or latex gloves, rubber boots, eye protection, ear plugs and hard hats as needed per the California Code of Regulations, Title 8, Hazard Communication and Personal Protective Equipment sections.

3. Medical Surveillance

- a. As required by 8 CCR 1529, the asbestos Contractor shall establish a medical surveillance program for all employees who may be exposed to asbestos at or above the permissible exposure limit. This requires an asbestos medical exam in accordance with Title 8 1529. All employers shall provide copies of the physician's written opinion for each employee who works on the project pursuant to 8 CCR 1529.
- b. Contractor will provide copies of the physician's written opinion for each employee who is required to wear a respirator confirming the ability of the employee to wear a respirator with no restrictions in accordance with 8 CCR 5144. This requirement applies to all asbestos employees and to all other employees required to work in the asbestos contaminated attic space, while wearing a respirator.
- c. All asbestos workers and asbestos supervisors shall pass the medical examination, FVC, FEV and chest x-ray examinations prior to working on the project.

3.08 PERSONAL HYGIENE

- A. No employee will be allowed to consume food, tobacco products or beverage in the regulated work area or any part of the building scheduled for asbestos abatement or in-place management operations. No food containers, water bottles, or any food will be allowed inside of the containment while work is performed under asbestos contaminated work conditions.
- B. Contractor shall establish a location outside the work area, which will be designated for employee eating and drinking. Employees must utilize the on-site decontamination facilities prior to entering the designated eating/drinking location. All workers entering the work containment shall wear proper shoes. Tennis shoes are not acceptable.

- C. The asbestos contractor shall install a three-stage decontamination unit for the asbestos abatement work exceeding 10 square feet of surfacing material or 25 linear feet of TSI and it shall be contiguous with the area that is being accessed. The clean room shall be sized and equipped to adequately accommodate the work crew. Lighting, heat and electricity shall be provided as necessary for comfort. This space shall not be used for storage of tools, equipment or materials (except as specifically designated), or as office space. Shower room shall contain one or more showers as necessary to adequately accommodate workers. The shower enclosure shall be constructed to ensure against leakage of any kind. In addition, the shower shall be a separate unit from the decontamination unit walls. The shower unit cannot be made from poly. Metal or hard plastic is acceptable. The third chamber equipment room (dirty room) shall be sized to accommodate movement of materials, equipment and supplies into and out of the containment work area.
- D. An adequate supply of soap, shampoo and towels shall be supplied by the Contractor and available at all times. The shower shall provide hot water, which will require the contractor to bring a portable hot water heater for this purpose. Shower water shall be drained, collected and filtered through a system with at least 5.0 micron particle size collection capability. The shower pan in the shower chamber shall be, at least, 3' x 3' in size. The shower chamber shall be constructed so that no water from the shower can spray out of the chamber, or any water run down the sides of the poly and miss the pan. The shower chamber dimensions shall be determined by the size of the shower pan but are not to be smaller than 3' wide by 3' long by 7' tall. At least one shower shall be provided for each 10 workers.
- E. After the asbestos abatement work has been completed by the asbestos contractor, the shower shall remain attached to the second anteroom for use by the various trade contractors if they choose to use the shower.

3.09 AIR MONITORING PROGRAM

A. Personal Air Samples - Contractor Responsibility

1. The asbestos Contractor must presume Class I, II, and III work will exceed the PEL and conduct air sampling for asbestos in accordance with 8 CCR 1529. The air sampling results will not be used to determine if respiratory protection will be required. Respiratory protection will be required during all asbestos abatement activities and during access at any time into the attic spaces, regardless of the air sampling results. The air sampling results will be used to assess the effectiveness of engineering control measures.
2. At least 25% of the asbestos workers per work shift shall be evaluated for asbestos assessment on a daily basis by the Contractor using personal air sampling. The asbestos contractor is responsible for collection of air samples on the various trade workers performing work in asbestos contaminated work spaces.
3. Sample results shall be emailed to UCDMC Project Manager Representative, Jim Davis, FAX 916-734-7751; UCDMC EH&S Kaila Benton-Vitz FAX 916- 734-7309; and UCDMC Representative's Consultant, (Rick Beall, Entek Consulting

Group, Inc. FAX 916-632-6812.

4. Daily monitoring may be discontinued for a particular operation when a negative exposure assessment has shown the operation was performed below PEL for three continuous shifts. This exception does not apply when the scope of the job has changed, ACM/PACM has changed or the UCDMC Representative feels the work protocol is compromised, e.g., less skilled workers are not performing up to standard.
5. Personal air samples for asbestos exposures shall be collected of workers in the asbestos contaminated attic space or in locations with ceiling open to the attic space during work installing plumbing, electrical, HVAC, ceiling system and other trade work.
6. A Negative Exposure Assessments (NEA) established outside the University is unacceptable. NEAs performed on the campus that "closely resemble" current work shall be considered. Final acceptance of an NEA is made by EH&S and the UCDMC Representative. Review and acceptance of NEAs will not be used to exclude the use of respiratory protection.
7. Air sample results are required to assess the trade workers in the attic space to determine if a higher level of respiratory protection is required (PAPR), additional work practices are required, and if showering by the trade workers will be required.

B. Area Sampling

1. Daily Monitoring - University's Representative's Responsibilities
 - a. The UCDMC Representative is responsible for monitoring air quality within the regulated area; including the clean room and immediately outside of the clean room. Any sample at or above 0.1 f/cc in the clean room or outside of the clean room requires a cessation of work until the area is cleaned, the cause of the problem has been determined and remedied. Air samples in the work zone that exceed the protection level of a respirator require a cessation of activity and review of work practices by the Contractor's supervisor and the UCDMC Representative. The UCDMC Representative may utilize the asbestos contractor's personal air sampling results to assess the work area air concentrations if the sampling protocol used by the contractor are deemed reliable.

3.10 SPECIFIC WORK PROTOCOLS

- A.** The specific work protocols are intended as a supplement to the contract provisions. Contractor shall comply with specific work protocols and all other specifications. Where a conflict in specifications exists, the higher standard applies. Not all of the asbestos materials described below might be impacted by the project. They are provided in the event the project expands and the specific materials are impacted.

1. Acoustical Ceiling Tiles (suspended ceiling)
 - a. Class II or III
 - b. Friable
 - c. Respirator Required
 - d. No NPE if Class III, NPE for Class II, HEPA vacuum, Wet Method

e. Work Practices:

- 1) Remove individual ceiling tiles from grid work using caution not to damage the metal grid work. Protect lighting fixtures and smoke/heat detectors scheduled to remain.
- 2) Where removal of metal grid work is required, tie-up lighting fixtures and/or heat/smoke detectors. Removal of metal grid work will include all wire hangers, perimeter and interior grid work.
- 3) Where lighting fixtures are scheduled to be removed, clean lighting fixtures and apply a single layer 6-mil plastic or bag and sealed with tape. All lighting fixtures shall be turned over to the University's Representative.
- 4) HEPA vacuum and wipe down all exposed surfaces above the ceiling system removed and then apply an approved encapsulant or lockdown material.

2. Acoustical Wall and Ceiling Tiles (glued on – whether the mastic contains asbestos or not)

- a. Class II or III
- b. Friable
- c. Respirator Required
- d. NPE, Wet Method, HEPA vacuum
- e. Work Practices:

- 1) Remove tile in small sections capturing individual tiles in a container as close to the point of removal as possible, in order to minimize the amount of material dropping to the floor.
- 2) Debris and waste spilled onto floors, ladders or other surfaces shall be cleaned up as soon as possible. Under no circumstances shall debris be left at the end of the workday.
- 3) Scrape and remove tile adhesive flush with wall and ceiling surfaces.

3. Air Cell Pads

- a. Class I, II or III
- b. Non-friable if intact
- c. Respirator Required
- d. No NPE if Class III, NPE for Class II, Wet Method, HEPA vacuum

4. Asbestos Cement Pipe (intact)

- a. Class II
- b. Non-friable
- c. Respirator Required
- d. No NPE

e. Work Practices:

- 1) Disconnect service to the pipe.
- 2) Mark pipe in lengths of approximately six (6) to ten (10) feet or other reasonable length to handle.
- 3) Wrap pipe with lagging intact with two (2) separate layers of 6-mil plastic, securely and completely taped.
- 4) Disconnect service to pipe being removed.
- 5) Place plastic underneath pipe and supports to catch falling pieces.
- 6) Carefully supporting all portions of pipe/paneling, break into sections using chain snap cutter or the means of cutting or breaking without creating dust. Power cutters or saws are not acceptable.

5. Glasweld, wainscot, and adhesive

- a. Class II or III
- b. Non-Friable
- c. Respirator Required
- d. No NPE if class for class II, HEPA vacuum
- e. Work Practices:

- 1) Remove material in manageable sections without sizable quantities of materials dropping to the floor.
- 2) Do not sand, grind, blast or mechanically chip or abrade surfaces to remove adhesive.
- 3) Scrape wall surfaces to remove excess adhesive flush with wall surface.
- 4) Wipe down all exposed surfaces prior to applying an approved encapsulant or lockdown material.

6. Gaskets

- a. Class III
- b. Friable
- c. Respirator Required
- d. No NPE Dispose at Class III Land Fill

7. Gypsum board and joint compound

- a. Class II or III
- b. Friable
- c. Respirator Required

- d. NPE, Wet Method, HEPA vacuum
- e. Work Practices:
 - 1) Remove material in sections manageable without sizable quantities of materials dropping to the floor.
 - 2) Use a power tools to cut material to be removed with a HEPA vacuum attached to the shroud. Hand cutting with a scoring knife shall be permitted as an alternative option. Keep all cuts moistened to minimize dust.
 - 3) Keep debris and dropped waste material to a minimum. Under no circumstances shall debris be left at the end of the workday.
 - 4) Construct mini-containment or attach modified glove bag to wall surfaces; attach materials with taped portion being attached to tape strips applied directly to wall, floor and ceiling surfaces. Allow adequate room for maneuvering of hands within containment.
 - 5) Spray gypsum board to be removed with water and hand cut perimeter of material to be removed with a knife.
 - 6) Allow wetted material to drop into bottom of glove bag.
 - 7) Evacuate air from glove bag and wall cavity using HEPA vacuum; tie off lower section of glove bag prior to spraying wall and ceiling surfaces and cavity with encapsulant.
 - 8) For locations requiring back to back abatement; leave glove bag or mini-containment in place until work has been completed on both sides of the wall.

8. HVAC insulation

- a. Class I
- b. Friable
- c. Respirator Required
- d. NPE, Wet Method, HEPA vacuum

9. Linoleum floor backing and adhesives

- a. Class II or III
- b. Friable
- c. Respirator Required
- d. NPE, Wet Method, HEPA vacuum

10. Paints (textured)

- a. Class II or III
- b. Friable

- c. Respirator Required
- d. No NPE if class III, NPE for class II, HEPA vacuum, Wet Method

11. Plaster (interior and exterior)

- a. Class II or III
- b. Friable
- c. Respirator Required
- d. No NPE if class III, NPE for class I, HEPA vacuum, Wet Method
- e. Work Practices:
 - 1) Remove plaster material in manageable sections without sizable quantities of materials dropping to the floor.
 - 2) Work shall include removal and disposal of plaster, expanded metal mesh and non-structural ceiling joists. Bag all materials as removed. Tape sharp edges as needed to prevent the bag from being punctured.
 - 3) Do not use power tools to cut material to be removed. Keep all cut material edges and surfaces moistened to minimize dust.
 - 4) Keep debris and minor dropped waste to a minimum, and immediately moisten and clean up. Under no circumstances shall debris be left at the end of the workday.
 - 5) HEPA vacuum and wipe down all exposed surfaces to remain prior to applying an approved encapsulant or lockdown material.

12. Rubber Cove Base Adhesive

- a. Class II or III
- b. Non-Friable
- c. Respirator Required
- d. No NPE if class III, NPE for class II, HEPA vacuum, Wet Method
- e. Work Practices:
 - 1) Provide protective splash barriers for all wall surfaces. Contractor shall provide decontamination systems at all personnel exits from the work area.
 - 2) Remove material in manageable sections.
 - 3) Do not sand, grind, blast or mechanically chip or abrade surfaces to remove adhesive.
 - 4) Scrape off excess adhesive flush with wall surface.
 - 5) Wipe down all exposed surfaces prior to applying an approved encapsulant or lockdown material.

13. Soil (asbestos contaminated)

- a. Class II or III

- b. Friable
- c. Respirator Required
- d. No NPE if class III, NPE for class II, HEPA vacuum
- e. Work Practices:
 - 1) All foundation vents, grates and other openings will be securely sealed with plastic and tape.
 - 2) Contractor shall set grade stakes on minimum fifteen (15) foot centers throughout the area from which soil is to be removed.
 - 3) Contaminated soil shall be dampened and kept damp during removal operation.

14. Steam/Hot Water Pipe Lagging (horizontal, vertical, joints, valves)

- a. Class I or III
- b. Friable
- c. Respirator Required
- d. NPE, Wet Method, HEPA vacuum
- e. Work Practices
- f. Class III Work Practices:
 - 1) Contractor shall comply with UCD access protocols, which requires respirator and double suit.
 - 2) Apply duct tape completely around the pipe at point where glove bag will be attached.
 - 3) Slit glove bag down sides; install on pipe with taped portions being attached to tape strips applied to pipe. Allow adequate room for maneuvering of hands at top of glove bag.
 - 4) While assistant sprays lagging continuously with water amended with surfactant, cut lagging around its circumference using handsaws, knives, or other cutting tools.
 - 5) Remove wetted lagging, drop into bottom of glove bag.
 - 6) Clean surface under section of removed lagging using toothbrush, towel, etc.
 - 7) Evacuate glove bag using HEPA vacuum cleaner; tie off glove bag.
 - 8) Remove glove bag from pipe. Seal glove bag using at least two closures. Seal exposed lagging ends with bridging agent and Carlisle Hardcast wettable cloth or equivalent.
- g. Class I Work Practices
 - 1) Set up full containment
 - 2) Establish baselines and conduct area monitoring throughout the project.

15. Transite (siding, shingles, furnace flue, and duct)

- a. Class II or III
- b. Friable and Non-friable
- c. Respirator Required
- d. No NPE, Wet Method
- e. Work Practices:
 - 1) Provide plastic on the horizontal surface below the area of work extending out sufficient to capture material being removed.
 - 2) Remove material in manageable sections and lengths without sizable quantities of materials dropping to the floor or ground using wet methods.
 - 3) Where possible, remove mechanical fasteners without any abrading of transite material.

16. Floor Tiles, rubber cove base and adhesive

- a. Class II or III
- b. Non-friable
- c. Respirator Required
- d. No NPE if class III, NPE for class II, Wet Method, HEPA vacuum
- e. Work Practices:
 - 1) Flooring shall be removed only by hand or mechanical methods which do not create dust. These include dry ice/blanket, hand and power scrapers, spud bars, etc. Do not sand, grind, blast or mechanically chip or abrade.
 - 2) Adhesive shall be removed only by wet methods or by approved solvent.

17. Window Putty

- a. Class II or III
- b. Friable
- c. Respirator Required
- d. No NPE, Wet Method, HEPA vacuum
- e. Work Practices:
 - 1) Provide plastic on the horizontal surface below the area of work extending out sufficient to capture material being removed.
 - 2) Remove material in manageable sections and lengths without sizable quantities of materials dropping to the floor or ground using wet methods.

18. Above Ceiling Work - Areas with Asbestos Containing Fire Proofing or Pipe debris

- a. Class I or III
- b. Friable

c. Respirator Required

d. NPE, Mini-containment

e. Work Practices:

- 1) Use of a respirator, disposable protective coverall, and gloves are required to enter above the ceiling.
- 2) A mini-containment or other NPE must be set up and used by employees to safely enter the attic space above the ceiling system. The mini-containment/NPE must be kept under negative pressure using at a minimum a HEPA vacuum that has been certified within the last year or last filter change, whichever is more recent. A three stage decontamination unit with a shower is required when more than 10 square feet of fireproofing are removed.
- 3) Clean the entry area above the ceiling with a HEPA vacuum before completely entering the space.
- 4) If practical, vacuum visible insulation debris for the full path of travel. If this is not practical the employee must use other procedures to ensure safe removal of visible insulation debris in the path of travel that would be disturbed by the crawl. For example, wet paper towels and plastic bags may be used to pick up and contain visible debris. Other control methods may be used provided they meet the following criteria:
 - a. dry sweeping is not permitted
 - b. employees must not walk on, crawl on or otherwise crush visible clearly recognizable insulation debris
 - c. the control method must not result in a release of airborne fibers
- 5) If disposable coveralls get torn during the work activity, immediately repair the torn coverall with duct tape or exit the area and put on a new coverall. Before leaving the mini-containment inspect the personal clothes and shoes/boots of any person that entered the above ceiling area and remove any visible debris using the HEPA vacuum.
- 6) Upon completion of work at that location, inspect the floor where the mini-containment was set up and remove any debris using the HEPA vacuum.

3.11 INSPECTIONS

A. Inspection Responsibilities - Contractor

1. Prior to beginning any asbestos-related work, Contractor's asbestos supervisor shall inspect the regulated work areas for any building damage, hazardous conditions, and/or irregularities that may contribute to an unsafe work environment. Any condition that poses a hazard or potential hazard to the

Contractor's employees or the University community must be immediately reported to the UCDMC Representative.

2. Contractor is responsible for monitoring and enforcing all requirements of this specification. This responsibility includes communicating scheduling changes to the UCDMC Representative to allow inspections at each phase of the project.
3. Contractor shall provide protocols for responding to loss of negative pressure after they have left the job site. Under no circumstances shall Contractor shut off negative air machines at the end of the shift, unless the job has received final clearance. Emergency mobile telephone numbers shall be provided of key asbestos Supervisors on the project to the University's Representative in the event they need to be contacted after off hours.
4. At the end of each shift, the Contractor shall adequately wet waste, collect all loose debris, place it in double 6 mil poly bags, and label the material. The asbestos waste may remain inside the containment, provided access controls are secure. If the Contractor cannot guarantee access control, the asbestos waste must be secured in a locked storage container.
5. The Contractor supervisor shall perform a thorough pre-final visual of the containment work area and adjacent surfaces prior to requesting that the University's Hazardous Materials Representative conduct a final visual inspection. The pre-final visual performed by the Contractor shall verify that all materials have been completely removed from the work area.

B. Inspection Responsibilities – UCDMC Representative Asbestos Consultant Responsibilities

1. Shall walk the job site with the Contractor to review pre-cleaning operations and any safety or security issues and may attend contractor safety meetings.
2. Shall verify pre-cleaning was performed in accordance with the specifications.
3. After the Contractor has completed set-up and before commencing operations, the UCDMC Representative shall check completeness of the following items: regulated area is demarcated and posted with Cal/OSHA asbestos warning signs, permits are posted, poly sheeting is six mil, double layers, all HEPA equipment is challenge leak tested and passed the challenge tests, electrical tools are connected to GFCI, HVAC is shut off and all supply and return registers (if possible), exhaust register are sealed with six mil poly, electrical panels are tagged and locked out (if possible), electrical outlets are sealed with 6 mil poly, a fire extinguisher is available outside the containment, and water connections are made with a back flow prevention device. If a NPE is used, the inspector will verify: a minimum of -0.020" of water pressure is maintained, three-stage decontamination is sealed and air flow is correct, and the shower is functioning with a hot water heater, soap, shampoo, and disposable towels.
4. Prior to asbestos abatement or in-place management activities beginning, the UCDMC Representative shall match on-site personnel with asbestos training certificates, fit tests and medical exam records. Workers without current and valid on-site documentation shall not be allowed in the regulated area.

5. The UCDMC Representative is responsible for reviewing all samples and alerting EH&S staff and the UCDMC Project Manager, of any personal or area air samples exceeding 0.1 f/cc.
6. During abatement or in-place management activities, the UCDMC Hazardous Materials Representative shall check for the following: all personnel are signing in and out, wet methods are being used, debris is collected at the end of each shift, workers are properly wearing disposable coveralls and respirators, and work is performed in a safe manner.
7. The UCDMC Representative shall file a report with the UCDMC Project Manager in the frequency desired by the UCDMC Project Manager.
8. When only spot removal of fireproofing is performed for attachment of bracing, etc., clearance air sampling is not planned for the small spot abatement work in the attic space.
9. In the event of asbestos abatement when encapsulation is required, the following will apply. After abatement or in-place management activities are complete and before lockdown or encapsulant is sprayed, the UCDMC Representative shall verify: completeness of abatement or in-place management work by conducting a thorough visual inspection of the work area, confirm and approve the lockdown (encapsulant) being used, and confirm all SDS are on-site for materials used by the contractor.
10. Shall review clearance protocols with the Contractor prior to clearance monitoring. If clearance is not achieved, the Contractor shall re-clean the containment area prior to re-sampling the regulated area. All re-sampling costs due to clearance monitoring failure are the responsibility of the contractor.
11. After clearance has been achieved the UCDMC Representative shall ensure the work area is clean and free of all equipment, all waste has been removed in accordance with University protocols, keys are returned and the Contractor has restored the room to its original condition or to an otherwise agreed upon state.

3.12 CLEAN-UP

A. Daily Clean-Up

1. The project work area shall be cleaned on a regular basis. The interior of the anterooms shall be free of all visible debris and materials. At the end of each work shift, the floor of the anterooms shall be HEPA vacuumed or wet wiped or both to remove all debris from the plastic surfaces. The sticky mats shall be change on a regular basis to be effective.
2. Where asbestos is removed from spot abatement, all asbestos debris shall be adequately wetted, collected, and placed into two 6 mil plastic bags with Cal/OSHA asbestos warning labels attached. Additional labeling requirements will be required for friable waste materials. Excess air shall be HEPA vacuumed from the bag, and shall be closed in a goose-necked fashion and secured with tape. No bag shall exceed a gross weight of 30 lbs.
3. Materials exceeding the size of a 60" bag may be sealed in "burrito" wrap fashion which requires the materials to be adequately wetted, then double wrapped in 6 mil plastic sheeting and sealed air tight with tape, Cal/OSHA asbestos warning

labels attached or the black diamond label, generator name and address and Waste Manifest number attached if the waste is friable asbestos materials.

4. At the end of each work shift, all asbestos waste shall be secured in a locked container. The containment shall also be made secure such that unauthorized access is not allowed during off-work hours.

B. Final Clean-Up

1. HEPA vacuum all visible debris and dust on the inner (top) layer of poly.
2. Wipe down interior surface of the inner (top) layer of poly of all gross asbestos debris.
3. Remove inner (top) layer of poly and dispose as asbestos waste.
4. HEPA vacuum or wipe all visible dust and debris from the outer (bottom) layer of poly.
5. Apply encapsulant inside of the entire containment area.
6. Remove the outer (bottom) layer of poly and clean all visible dust and debris that is present behind this poly shall be cleaned by HEPA vacuuming and wet wiping. At this time only the critical barriers shall remain in place with the building finishes exposed and in need of final detail cleaning. Floor and wall poly shall be removed prior to the clearance air sampling, unless specific changes have been approved by the UCDMC Hazardous Material Representative.
7. When step 6 is achieved, the area is ready for clearance sampling with the critical barriers and decontamination unit left in place with the work area still under negative pressure.

3.13 WASTE DISPOSAL

- A. The Contractor shall propose their choice of hazardous waste site that accepts asbestos to EH&S and obtain EH&S approval of the hazardous waste site before the Contractor ships off the waste material. EH&S must be contacted at least five working days prior to the date of first shipment.

1. Contractor shall comply with all waste protocols established by EH&S. These protocols explicitly require Contractor to properly complete the Uniform Waste Manifest form. Failure by Contractor to complete Contractor's portion of the form shall result in the Contractor assuming the fine imposed by the responsible agency.

B. Packaging Asbestos Waste

All asbestos containing waste material must be packaged in one of three ways: (1) placed in two 6 mil clear polyethylene bags that are sealed with the "gooseneck" style, (2) placed in one 6 mil clear polyethylene bag and then placed into a sealed drum (DOT approved) or (3) double wrapped in opaque 6 mil polyethylene sheeting (AKA "burrito style"). For options 1 and 3 wet wipe the outer surface before storing material.

C. Labeling Asbestos Waste

Each bag, drum, or "burrito" wrap shall have a label affixed with the following information: (1) Hazardous Waste warning, (2) Generator's Name, address, and phone number, (3) Location information, e.g., Building, department, room, (4) manifest document number, and (5) date. Contractor can generate the label or use bags with label information stenciled on the side. For non-hazardous asbestos waste, a Hazardous Waste Manifest is not required; however, at a minimum, the Cal/OSHA asbestos warning label is required per Title 1529.

D. Transporting Waste

All sealed waste bags removed from the work area containment shall be transported inside of closed leak tight plastic bins with lids on wheels that can be rolled from the project area in the building to the waste bin located outside of the building. The door of the waste bin shall have the required asbestos warning sign attached and visible during all loading of the asbestos containing waste.

E. Storing Asbestos Waste Outside of a Building

At the end of each shift, all asbestos waste shall be stored in a locked container or shipped off site. Accumulated waste shall not be allowed to remain in the regulated work area overnight, unless prior approval is provided the EH&S. No container shall be allowed to remain on campus for greater than 90 continuous days from date the first asbestos waste container was generated.

F. The Waste Identification Notice and Certification must be completed by the Contractor to comply with waste stream identification requirements (Title 22, CCR). The Waste Identification Notice and Certification form can be obtained from EH&S.

G. Uniform Waste Manifest Procedures

Prior to transporting waste from the project site to a disposal facility, the Contractor shall prepare a California Uniform Hazardous Waste Manifest (form DTSC 8022A). After completing Contractor's portion of the form, Contractor shall return the Manifest to EH&S for signature between the hours of 8:00 AM to 5:00 PM Monday to Friday, and will require a 24 hour notice to EH&S for the signature. Only authorized EH&S personnel can sign on behalf of the University (generator). The Generator is UCDMC. EPA ID No. CAD076124981. The Generator address is 2315 Stockton Blvd., FSSB 2500, Sacramento, CA 95817.

H. Contractor shall complete the Waste Shipment Record supplied by EH&S.

The three forms (Waste Identification, Uniform Waste Manifest, and the Waste Shipment Record) must be submitted together as a single approval request to EH&S.

J. Transporting Asbestos Waste

A registered waste transporter, hired by the Contractor, is responsible for transporting asbestos waste from the project site to a disposal facility permitted for asbestos waste. The landfill has to be approved by UCDMC EH&S, who requires seven (7) day's notice to review and approve the landfill. The transporter must make pick-ups during normal working hours (8:00 AM to 5:00 PM Monday through Friday). The transporter's vehicle must be clearly marked with warning signs. To avoid illegal transport of asbestos waste, Contractor is responsible for knowing if the job site is contiguous with the main University campus. If Contractor must cross public streets to load asbestos waste in the container, the Contractor must comply with Sacramento Metropolitan Air Quality Management District (SMAQMD) requirements.

K. Record Keeping

The University's Representative is responsible for assisting EH&S with collecting all documents related to waste disposal operations.

L. Fees

Contractor is responsible for all fees and charges related to waste disposal operations; including, waste stream profiles. Refer to SW-846-1311 (TCLP) and CCR, Title 22 Section 66261 (STLC) for identification requirements.

3.14 CLEARANCE PROTOCOL

A. Project Specific

1. The clearance protocol to be used shall be clearly stated and communicated in advance of the UCDMC Hazardous Materials Representative beginning the clearance procedure.
 - a. All containment areas of asbestos abatement will have clearance air samples analyzed by TEM per the AHERA analytical method. The exception to this is when very small amounts of asbestos are removed, or for example when spot asbestos removal of fireproofing materials is conducted in the attic space. In these cases, clearance air sampling might not be conducted.

B. PCM Clearance Method

1. PCM analysis for clearance air samples will not be used on UCDMC projects.

C. TEM Clearance Method (Where Used or Required)

1. The TEM analytical method is the primary method that will be used on UCDMC asbestos abatement projects. Clearance protocol for TEM Method shall conform to EPA AHERA standard pursuant to 40 CFR Part 763, Appendix A to Subpart E TEM analytical methods, with the exception that fewer number of air samples may be collected and analyzed.
2. Air samples shall be collected on MCE cassettes with a 0.45 micron pore size.

3. The Contractor may elect to sample first with PCM to get an indication of the level of cleanliness.
4. After the lock down/encapsulant is settled and dry, a leaf blower will be used to agitate all surfaces within the negative pressure enclosure (referred to as the aggressive air sampling method). One or more free standing 24" fans will be placed inside of the work area to facilitate additional air movement inside the containment for the duration of the air sampling period.
5. The clearance criteria shall be the AHERA standard. The average of all air samples collected inside of the work area shall be ≤ 70 asbestos structures per millimeter squared. If the clearance criteria is not met, the Contractor is responsible to re-clean the entire containment area, and the UCDMC Representative shall collect clearance air samples again. Air sampling shall continue until the sample results meet the clearance criteria. All additional cleaning of the containment by the contractor and additional costs for the collection and analysis of the air samples will be at the expense of the contractor.

3.15 PROJECT CLOSE OUT

- A. Before the final certificate for payment is issued to the Contractor the following information shall be provided to the University's Representative:
 1. Provide post job submittals to include:
 - a. Contractor's name, address, CSLB certification number, DOSH registration number, and tax identification number.
 - b. Name of hazardous transporter, address, phone number and registration number.
 - c. A copy of the asbestos waste record showing dates, times, manifest numbers, quantities of wastes, types of containers removed from the work area, the hauler, and the signature of the recorder.
 - d. Name, address, phone number and EPA registration number of waste disposal site.
 - e. Copies of all laboratory analysis of air samples.
 - f. Building name and address.
 - g. Project name and contract number.
 - h. Describe scope of work; including, location (room numbers, approximate square footage, building system types).
 - i. Provide an inventory of the ACM/PACM removed from the job site. Include, building system, classes of asbestos related work, quantity, note whether the project was abatement or managed in-place, note whether the building system(s) was replaced.
 - j. A copy of the worker/visitor logs showing the following for all persons entering the work area: date, name, entry time, exit time, company or agency represented, and reason for entry. The Contractor's time records will not be accepted in lieu of a worker/visitor log.
 - k. Date on-site work began.

- l. Date on-site work was completed.
- m. Copies of DOP Testing Performed on HEPA Equipment not Previously Submitted
- n. Manometer graphs identifying project name, date, and location.
- o. Copies of all accident reports submitted during the course of work. If no accidents occur during the project this should be stated in writing by the Contractor.
- p. Copies of revised notifications to all regulatory agencies.
- q. Other Documents as Requested

END OF SECTION 02 82 00

SECTION 02 83 00
HAZARDOUS MATERIALS MANAGEMENT – LEAD & OTHER HAZARDOUS MATERIALS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. WORK INCLUDED - GENERAL

1. The Contractor shall furnish all labor, material, equipment, services, testing, employee training, fit testing, medical exams, transportation, and daily expense to meet the requirements of this Specification.
2. The Contractor shall obtain all required permits, licenses, registrations, notifications, and regulatory approvals required by law (federal, state and local) and University of California Davis Medical Center (UCDMC) policy.
3. All lead-related activities associated with this Contract shall be performed during the work period specified in each contract.
4. The Contractor shall guard against unnecessary disturbances or damage to sensitive finishes on buildings, building systems, and equipment.

B. WORK INCLUDED – SPECIFIC

1. The Contractor is responsible for identifying the exact locations and number of work areas listed below by referring to University supplied Project Drawings and by working with the University's Representative or University's Hazardous Materials Consultant.
2. This project does not include lead abatement or lead remediation. This project includes work on building components that have been tested where lead is present in the paint in low concentrations which would indicate there is some "lead containing material" (LCM), and some materials above 1.0 milligram per square centimeter (mg/cm²), which is considered "lead-based paint" (LBP). This project is a renovation project and not considered a lead abatement project with regards to the requirements of Title 17.
3. Refer to the report MACTEC Engineering and Consulting, Inc. November 29, 2005 for the lead in paint inspection conducted in the East Wing. Please note when reviewing XRF test data, not every building surface in every room was tested for lead. The purpose of the surface testing for lead is to determine the general range in findings for lead in the paint. Measurements of lead found to be less than 1.0 mg/cm² (including measurements of 0.0 mg/cm²) still have low levels of lead and Cal/OSHA work practices per 8 CCR 1532.1 for lead still apply.

1.2 SITE CHARACTERIZATION

A lead in paint inspection and asbestos inspection report "East Wing Hazardous Materials Survey Report" prepared by MACTEC Engineering and Consulting, Inc., November 29, 2005 is attached as an Appendix A to 02 82 00 and to Section 02 83 00. This inspection report includes an assessment for hazardous materials including asbestos, lead in paint, fluorescent light tubes and ballasts containing PCB's. The contractor shall refer to this inspection report for locations where lead in paint has been identified in the East Wing.

- A. Hazardous materials, other than lead containing paints and Presumed Lead Containing Materials (PLCM) that have the potential to be disturbed at this Project site are listed in the table below:

Material Description	Type of Hazard	Location
Fluorescent Light Bulbs	Mercury	See Drawings
Light Ballasts	PCB's	See Drawings
Light Ballasts	Universal Waste	See Drawings
Mold Contamination	Mold	Undetermined
Caulking	PCB's	See Drawings
Thermostat Switches	Mercury	See Drawings
Building Components	Asbestos	See Section 02 82 00
Exit Signs	Radioactive Gas Tritium	See Drawings

1. Where "See Drawings" is noted in the above table or elsewhere in this specification; reference drawings identified in the sheet index for Location.

- B. Where light fixtures are required to be removed, the Contractor shall recycle all fluorescent light tubes and non-PCB containing ballasts as Universal Wastes as required in Title 22. All PCB containing light ballasts or caulking (if present) shall be sent to a hazardous waste site as a separate waste stream. Determination of potential PCB for each light ballast shall be made when the light fixture is removed from the building component. Packaging of light tubes and light ballasts shall be in accordance with regulatory standards for safe storage and transport by a hazardous waste hauler.

- C. Prior to handling other hazardous materials at the Project site, the Contractor shall review University's protocols with a UCDHS EH&S Representative.

1.2 ABBREVIATIONS AND DEFINITIONS

A. Abbreviation

AA	Atomic Absorption – Flame (EPA SW-846)
ABATEMENT	Removal of all Lead in the Building/Location or Specific Component
AIHA	American Industrial Hygiene Association
AL	Action Level (30 µg/M ³ per 8 hour TWA)
BLL	Blood Lead Level
CCR	California Code of Regulations
CDPH	California Department of Public Health
CEPA	California Environmental Protection Agency
CFR	Code of Federal Regulations
CSLB	Contractor's State Licensing Board
DIR	Division of Industrial Relations
dL	Deciliter
DOSH	Division of Occupational Safety and Health
DOT	Federal Department of Transportation
DTSC	California Department of Toxic Substances Control
EH&S	Environmental Health and Safety - UCDHS
ELLAP	Environmental Lead Laboratory Accreditation Program
ELPAT	Environmental Lead Proficiency Analytical Testing Program
EPA	U.S. Environmental Protection Agency
FVC	Forced Vital Capacity
FEV	Forced Expiratory Volume
GFCI	Ground Fault Circuit Interrupter

HEPA	High Efficiency Particulate Air
HUD	U.S. Department of Housing and Urban Development
HVAC	Heating, Ventilation, and Air Conditioning
ICRA	Infection Control Risk Assessment
INTERIM CONTROLS	Removal at specific locations to accommodate remodel < 20 years
LBP	Lead Based Paint (paints, varnish, shellac, etc. >0.5% lead by weight, >5,000 ppm, or > 1.0 mg/cm ²)
LCM	Lead Containing Material – materials tested to contain any measurable levels of lead
µg	Microgram = part per billion (ppb)
SDS	Safety Data Sheet
NAAQS	National Ambient Air Quality Standards
NAM	Negative Air Machine
NESHAP	National Emissions Standard for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NPE	Negative Pressure Enclosure
NVLAP	National Voluntary Laboratory Accreditation Program
O&M	Operations and Maintenance
OSHA	Federal Occupational Safety and Health Administration
PEL	Permissible Exposure Limit (50 µg/M ³ 8 hr. TWA)
PLCM	Presumed Lead Containing Material
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
TCLP	Toxicity Characteristic Leaching Procedure (mg/L)
TTLC	Total Threshold Limit Concentration (wet-weight mg/kg)
TSP	Trisodium Phosphate
TWA	Time Weighted Average
STLC	Soluble Threshold Limit Concentration (mg/L)
UCDHS	UC Davis Health System
ULPA	Ultra Low Penetrating Air
XRF	X-ray Fluorescence
ZPP	Zinc Protoporphyrin

B. Definitions: The following definitions are provided for additional clarification and may exceed Federal, State or local regulatory requirements.

1. Lead Abatement - "Abatement" means any set of measures designed to reduce or eliminate lead hazards or lead-based paint for public and residential buildings, but does not include containment or cleaning.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23 Shop Drawings, Product Data and Samples, and Section 01 77 00 Closeout Procedures.
- B. Submit proposed material substitutions complying with requirements listed in Section 01 60 00 Product Requirements.
- C. References: Submit names, addresses and telephone numbers of at least 3 Project Managers or Owners (not employed by Contractor) for whom Contractor has performed jobs of similar size and character to the work specified in this Contract.
- D. General: Submittal requirements listed below shall be completed and accepted by University's Representative prior to scheduling the start of project site work. Submit the

number of copies Contractor requires, plus 4 copies that will be retained by the University. Work shall not begin until such approval has been given, and a bound copy of project submittal is placed at an easily accessible location at the project site.

E. Notifications and Permits: Submit copies of all regulatory agency notifications and permits.

1. Contractor is required to submit a "Lead-Work Pre-Job Notification" (8 CCR 1532.1(p)) for all projects, if there is greater than 100 square feet or greater than 100 linear feet of materials containing lead greater than 5,000 ppm, 0.5% by weight, or 1.0 mg/cm² to be removed. If these quantities are exceeded, a copy of the notification to Cal/OSHA shall be provided to the UCDHS EH&S Representative.

F. Worker Training and Safety Programs

1. Training Certificates: For each employee who will be employed on the Project, submit a copy of employee's lead training that meets Cal/OSHA training requirements under Title 8 Section 1532.1 Lead in Construction. UCDHS requires all contractor and subcontractor personnel directly involved with lead abatement to have current CDPH lead training certificates at a level appropriate for the project task (e.g., Project Designer, Project Monitor, Supervisor, Worker, Inspector/Assessor), in the unlikely event that lead abatement is required for the project.
2. Qualifications of person taking Personal Air Samples: Submit information regarding training and qualifications of the field technician who will be collecting personal air samples.

G. Safety Programs: On company letterhead, submit confirmation that the Contractor has written safety programs for:

1. Injury Illness Prevention (T8 CCR 3203) (mandatory for all projects),
2. Hazard Communication (T8 CCR 5194) (mandatory for all projects),
3. Fall Protection (T8 CCR 1620 – 1621, 1632 – 1633, 1635.1 – 1637, 1640 – 1655, 1669 – 1672, 3209 - 3239) (when applicable),
4. Lock Out Tag Out (T8 CCR 3314) (when applicable),
5. Confined Space (T8 CCR 5156) (when applicable).
6. Respiratory Protection (8 CCR 5144) (when applicable)
7. Medical Surveillance (8 CCR 1532.1(i)) (when applicable)
8. Lead Compliance (8 CCR 1532.1(e)(2)) (when applicable)

H. Work Plan and Schedule: Submit proposed Work Plan and schedule. The Work Plan shall be project specific and address project site preparation, site and engineering controls, worker protection and exposure monitoring, and protection of building occupants from exposure to lead. Schedule of work must be submitted and approved before work begins. University's Representative will forward a copy to the Hazardous Material Consultant for review prior to commencement of work.

- I. Product Data Sheets and Safety Data Sheets (SDS): For all products proposed for use on the project, submit copies of the manufacturers' safety data sheets to the UCDHS EH&S Representative for review, and copies of the Product Data Sheets to the University Representative for review.
- J. Laboratory Qualifications: For any laboratory performing lead analysis the Contractor shall submit evidence of ELLAP and ELPAT certification and accreditation. Laboratories performing worker exposure sample analysis must submit evidence of AIHA IHLAP certification for metals if they do not have ELLAP or ELPAT certification.
- K. HEPA/ULPA Equipment Test: Submit copies of leak test results to the University's Representative prior to starting project site work. Leak testing shall be performed at the project site outside of the building and shall be witnessed by the UCDHS EH&S Representative or the Hazardous Materials Consultant. The leak test results shall identify equipment by make, model and serial number. Vacuums which fail may be used within full negative pressure enclosures at the discretion of UCDHS EH&S.
- L. Emergency Contact List: Submit an emergency contact list; include name, phone number, fax number and pager number for Contractor's supervisor or competent person and subcontractor's telephone numbers who can be reached on a 24-hour basis.
- M. Hazardous Waste Disposal Plan: Submit a Waste Disposal Plan that includes estimated number of containers, size of container(s), hazardous material transporter name and proposed disposal site before start of project. The disposal facility must be approved by the UCDHS EH&S representative prior to off-haul.
- N. Lead As-Built Summary: Submit a Lead As-Built Summary within 14 calendar days of the last day of field Work and prior to a request for final application for payment. The summary shall include a description of lead containing materials that were removed and a description of lead containing materials that remain in the project area.

1.4 CONTRACTOR QUALIFICATIONS

- A. Contractor licensing for this work will require a B, C33, C22 or C61/D-38 and appropriate lead training for employees to perform lead related work.

1.5 RULES AND REGULATIONS

- A. The Contractor shall comply with the most recent edition of applicable Federal, State, local, and University standards, laws, codes and regulations. If a conflict exists between referenced regulatory requirements and Contract Documents, the Contractor shall notify the University's Representative in writing and request the conflict be resolved. Contractor performing work contrary to mandated laws shall bear full legal and financial responsibility for the violations.
- B. The list of regulators and regulations, cited below, serve as a reference for the most commonly used standards governing the lead industry:

1. FEDERAL REGULATORS AND REGULATIONS

- a. EPA - Environmental Protection Agency
 - (1) 40 CFR Part 261 et al. - Resource Conservation and Recovery Act
 - (2) Title X - Residential Lead Poisoning Prevention Act
 - (3) National Ambient Air Quality Standards (40 CFR 50)
- b. OSHA - Occupational Safety and Health Administration

- (1) 29 CFR 1926.62 - Construction Lead Standard
 - (2) 29 CFR 1910.1025 - General Industry Lead Standard
 - (3) 29 CFR 1910.147 - Lock Out - Tag Out
 - c. DOT - Department of Transportation
 - (1) 49 CFR Parts 173, 178 and 179
- 2. STATE REGULATORS, LAWS AND REGULATIONS
 - a. Cal/OSHA - California Division of Occupational Safety and Health
 - (1) 8 CCR 1532.1 - Construction Lead Standard
 - (2) 8 CCR 5216 - General Industry Lead Standard
 - (3) 8 CCR 5194 - Hazard Communication
 - (4) 8 CCR 5157 - Confined Space
 - (5) 8 CCR 5144 - Respiratory Protection
 - (6) 8 CCR 3203 - Injury and Illness Prevention
 - b. DTSC - Department of Toxic Substances Control
 - (1) (Health and Safety Code Chapter 6.5 Hazardous Waste Control, Article 6 Transportation and Article 6.5 Hazardous Waste Haulers
 - (2) CCR, Title 22, Division 4, Sections 66000, et al.
 - c. CIWMB - California Integrated Waste Management Board
 - d. California Department of Public Health (CDPH)
 - (1) CCR, Title 17, Division 1, Chapter 8
 - e. SWRCB - State Water Resources Control Board – CCR, Title 23
 - f. CSLB - California Contractors State License Board
 - g. Health and Safety Code 25157.8 (AB 2784 Natural Resources)

1.6 NOTIFICATION AND PERMITS

- A. The Contractor is responsible for notifying Federal, State and local agencies, obtaining all required permits/extensions and paying all related fees, as required.
- B. UC Davis Health System
 - 1. To obtain a Hot Work Permit from the UCDHS Fire Protection Office, call 916-734-3036 for instructions.
 - 2. A Uniform Hazardous Waste Manifest shall be prepared by the Contractor or the transporter and approved by UCDHS EH&S for each load of hazardous waste transported from the work site. EH&S must be notified at least 24 hours prior to the anticipated time of shipment.
 - 3. Copies of records of non-hazardous waste removed from the project shall be provided to UCDHS EH&S, which may include Bill of Lading, non-hazardous waste receipts, etc.
- C. Sacramento Metropolitan Air Quality Management District (SMAQMD) has no notification requirements for lead related work. SMAQMD and Cal/OSHA do have notification requirements for asbestos related work. See Section 13280.
- D. Contractor is to submit a Lead-Work Pre-Job Notification to CAL/OSHA as required by 8 CCR 1532.1.

1.7 UNIVERSITY CONTACTS

- A. University's Representative: Jim Davis
 - 1. Phone: 916-734-4702
 - 2. Fax: 916-734-7751

B. UCDHS EH&S Representative: Kaila Benton-Vitz

1. Phone: 916-734-2740
2. Fax: 916-734-7309

C. University Hazardous Material Consultant: Rick Beall (Entek Consulting Group, Inc.)

1. Phone: 916-632-6800
2. Fax: 916-632-6812

PART 2 - PRODUCTS

2.1 MATERIALS

A. Safety Data Sheets (SDS)

1. The Contractor shall provide SDS for all products used on UCDHS job sites. The SDS files shall be located near the Project site entrance at all times the product is used or stored onsite.
2. One complete set of Safety Data Sheets is to be provided to UCDHS EH&S for review prior to the start of work. (see 1.4I)

B. Encapsulants

1. It is not anticipated encapsulant will be required for this project. If used, the choice of the correct encapsulant for a project is determined by agreement between the Contractor and the University's Representative. Two factors to consider in the choice are wear life (aim for 20 years) and usage patterns. Products shall be applied using a brush, roller or an airless sprayer. The Contractor shall follow strict manufacturer's instructions regarding surface preparation, ambient air conditions, depth of material penetration, recommended thickness of a dry application, and curing time.
 - a) For penetrating and lockdown purposes Foster 32-60, Certane 909, or equal is recommended.
 - b) For bridging purposes Foster 32-32, Certane 2000, or equal is recommended.
 - c) For high temperature applications, e.g., steam pipes, Foster 84-18, Certane 1000, or equal is recommended.
2. Any proposed equal to the products listed above must meet the following criteria: submit product information prior to the start of the Project and must receive approval by the University Representative and UCDHS EH&S Representative; non-toxic and non-irritating as defined by the Hazardous Substance Control Act; sufficiently tinted to provide contrast with the material being coated; and have a minimum 60 psi Batelle Standard impact rating.
3. All products shall be rated UL Class A and have a flame resistance/spread rate less than or equal to 25 as designated by the ASTM code E 162. Any exceptions must be pre-approved by UCDHS Fire Prevention Office (916-734-3036).

C. Polyethylene Products

1. Floor and wall sheeting used for lead containments or critical barriers are required to have a minimum thickness of: a) 6-mil (floor) and 4-mil (walls); and, b)

meet the following standards -- ASTM E-84, with a flame resistance/spread rate less than or equal to 25 ASTM (E-162).

2. The polyethylene sheeting used for containment or critical barriers shall be frosted or black. Polyethylene bags or sheeting used for waste may be clear.

D. Paint Removers

1. All paint removers shall be pre-approved by UCDHS EH&S. Methylene chloride based paint removers are not permitted on this project.
2. The use of paint removers on the project must strictly comply with manufacturer application instructions and safety warnings.

2.2 EQUIPMENT

- A. HEPA/ULPA vacuums and negative air machines must be leak tested on-site by a firm independent of the Contractor, who are trained and qualified to perform the challenge testing of portable HEPA filtered equipment, shall follow the manufacturers recommended test procedure, and shall use the recommended test challenge agent.
- B. Tools and equipment shall arrive at the project site free of lead debris and dust.
- C. HEPA/ULPA vacuum exteriors must be clean when they arrive on project site. All openings on the vacuum, hoses, and negative air units shall be taped shut when they are brought onto the project site and when they are taken from the project site..
- D. All electric tools and equipment shall be connected to a GFCI.
- E. Power tools used to prepare surfaces containing lead must be connected to a HEPA/ULPA vacuum.
- F. Heat guns with a working temperature less than or equal to 1100° F are permitted.

PART 3 - EXECUTION

3.1 SAFETY

- A. In accordance with State and Federal laws, Contractor shall be responsible for conditions of the project site; including the safety of all persons and property during the performance of work. To ensure effective communication in safety matters the Contractor shall participate and conduct the following meetings:
 1. A pre-construction safety meeting is required to be held with the University's Representative, University Hazardous Material Consultant, and the UCDHS EH&S Representative prior to the start of the project. The following subjects shall be discussed: Division 13 Specifications; impact to building occupants; waste disposal, and work related safety programs.
 2. On the first day of lead related work, the Contractor shall conduct a safety meeting (tailgate) for its employees and subcontractor employees that alert them to the specific hazards of the project. The Contractor must conduct the safety meeting in the primary language of its employees. If needed, more than one primary language presentation must occur. This same initial safety meeting must be provided to all personnel new to the project before they are permitted to start work.
 3. On a weekly basis, the Contractor shall conduct a safety meeting with its employees.

3.2 WORK SITE PREPARATION

- A. Prior to beginning any on-site work preparation, the Contractor shall walk the project area with the University Hazardous Material Consultant and UCDHS EH&S Representative to discuss site characterization, regulated area set-up, access controls, background samples, security, and safety issues.
- B. Post all regulatory notices, permits, sign-in-out roster, at the primary entrance to the project site.
- C. The Contractor, in coordination with the University Hazardous Material Consultant and UCDHS EH&S Representative shall ensure all electrical and HVAC equipment servicing the work area is disconnected and locked out. Electrical tools in the work zone must be connected to a GFCI.
- D. The Contractor shall seal existing critical barriers, including HVAC openings, windows, vents, open pipes, skylights, ducts, doorways, corridors, and diffusers with double layers of plastic and cardboard or plywood inserts as necessary.
- E. The Contractor shall pre-clean fixed objects and interior surfaces prior to establishing containment or critical barriers. The area to be pre-cleaned will be a minimum of 10 feet outside the Controlled area or surrounding structure which ever is closest. The Contractor will pre-clean exposed fixed objects and interior surfaces within the containment.
- F. The Contractor shall install approved backflow prevention devices before connecting to the University's domestic water system, if necessary. Contact the University's Representative for a list of approved devices.
- G. The Contractor is obligated to coordinate inspection schedules with the University's Representative and the University Hazardous Material Consultant.
- H. The Contractor shall establish project site control barriers.

3.3 WORK SITE CONTROL

- A. The Contractor shall restrict the work areas to authorized personnel; including, the Contractor's employees, University's Representatives, UCDHS EH&S Representative, University Hazardous Material Consultant and regulatory agency representatives.
- B. At regulated project sites, the Contractor shall use caution tape to demarcate the boundary of the work zone and post lead warning signs.
 - 1. The following sign is required by Title 8, CCR 1532.1

DANGER
LEAD WORK AREA
MAY DAMAGE FERTILITY OR THE UNBORN CHILD
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM
DO NOT EAT, DRINK OR SMOKE IN THIS AREA

- C. All unauthorized personnel are to remain outside the regulated area. The Contractor shall call the University's Representative, EH&S Representative or the University Hazardous Material Consultant if unauthorized UCDHS staff or the public enters the containment area.

- D. If inclement weather threatens the project site, the Contractor shall take all necessary measures to ensure lead-contaminated debris does not migrate from regulated areas. Steps shall also be taken to prevent water intrusion/water damage to the work site and adjacent areas.
- E. If wind speed threatens the project site, the Contractor shall erect a wind barrier or suspend operations until the wind is below 15 mph.

3.4 RECORDKEEPING

- A. The Contractor shall maintain the following records at the regulated work area:
 - 1. Site Log (sign-in/sign-out).
 - 2. Incident Log and Emergency Action Plan.
 - 3. Personal air sampling results.
 - 4. Area sample results from inside and outside the regulated area.
 - 5. Lead Supervisor (Contractor) and Lead Worker training certificates, respirator fit tests, and medical clearance certificates.
 - 6. Federal, state or local notifications.
- B. All Items 1 through 6 shall be submitted with the "As-Built" summary Identified in "Project Close-Out".
- C. The University Hazardous Material Consultant shall retain all sample records (wipe, bulk, initial, area (perimeter), and clearance samples). Results are reported on a daily basis to UCDHS EH&S and to the Project Manager. At the end of the project, all sampling records are submitted as a complete package in the project close out to the Project Manager.

3.5 ADMINISTRATIVE CONTROLS

- A. Any remediation project performed in high heat environments requires the Contractor to comply with T8 CCR 3395, including providing sufficient breaks to maintain a safe environment for their workers.

3.6 ENGINEERING CONTROLS

- A. Negative Pressure Enclosure (NPE)
 - 1. Containment protocols shall follow the ICRA requirements when building materials will be disturbed, or removed creating potential dust release.
 - 2. Mini-containments: The construction of a mini-containment requires a minimum of one layer of 6-mil polyethylene and a HEPA/ULPA vacuum or HEPA filtered negative air unit exhausting from the containment.
 - 3. HEPA vacuumed assisted tools shall be used for drilling, cutting, sawing, or removing lead containing paint from surfaces, unless a paste type stripper product is used.
- B. Lead Shielding
 - 1. Where lead shielding is to be removed that are associated with walls, floors, ceilings, doors or windows in areas of radiology/X-Rays the contractor shall install 6-mil plastic on the floor immediately surrounding the wall being removed that contains the lead shielding, extending out at least the height of the wall being

removed. If ceilings containing lead shielding are removed, the entire floor area shall be sealed with plastic.

2. The lead shielding shall be removed using manual tools such as screw drivers, razor knives, shears, and pry bars. Power tools, heat guns, cutting torches, and other high temperature generating processes are prohibited due to rapid friction and heat increasing the potential to create lead fumes or dust.
3. Contractor shall use methods to minimize airborne lead to the greatest extent possible (e.g., removing an entire wall instead of removing sheetrock from lead shielding prior to removal).

C. HEPA/ULPA Equipment

1. The Contractor shall ensure all HEPA/ULPA filtration units are leak tested on project site by an independent testing contractor. Each piece of equipment shall be tested in compliance with the ANSI Z9.2 Standard (trapping and retaining 99.97% of all test particles of 0.3 microns). Documentation of testing is to be maintained at the work site. The UCDHS EH&S representative or Hazardous Materials Consultant shall be present to observe the challenge testing of all HEPA systems brought onsite.
2. The Contractor shall HEPA/ULPA vacuum visible debris prior to set-up, during the removal process and at the conclusion of each shift.
3. HEPA/ULPA equipment used to establish negative air pressure within a space must run continuously (24-hours a day) until the project is complete.
4. The Contractor shall ensure make-up air is drawn through an inlet that can be easily sealed in the event of a negative air failure. The inlet sealing method must also be effective when there is a failure in the system after normal work hours.
5. All HEPA/ULPA filters must be disposed as hazardous waste.
6. Any HEPA system that has been removed from the project site and brought back to the project site shall be challenge tested again before being placed in use.

D. Wet Methods

1. Prior to removing LCM/PLCM, the Contractor shall adequately wet the material with water. The waste must remain wet until properly packaged for disposal.

E. Removal Operations

1. If there is lead abatement work, as defined in these requirements, the Contractor must use a CDPH-Certified Lead Supervisor and CDPH-Certified Lead Workers. The Lead Supervisor must be present onsite at all times.
2. Ensure all accumulated debris is completely sealed by the end of the shift. After gross debris is bagged, use wet wipe methods and HEPA/ULPA vacuums to clean the polyethylene sheeting.

F. Infection Control

1. An Infection Control Risk Assessment (ICRA) will be developed for this project by the University's Representative and approved by the UCDMC Infection Prevention. Depending upon the location of the work and the potential for dust generation that could impact patient care, the ICRA may require more stringent controls than those described under this specification including the requirements for negative pressure work environments. Adequacy of controls may be verified by periodic airborne particle counting, conducted by EH&S or a designee. Contractor understands that any operations generating excess particles in

uncontained locations will cause Contractor to modify site controls. Contractor is responsible for maintaining controls to avoid pollution of patient care spaces.

3.7 WORKER PROTECTION

A. The following protective measures are required for lead-related work associated with this project. These measures are not intended to be all-inclusive:

1. Employee Training/Supervision

- a. The Contractor shall provide information to its employees about lead and other hazards per the Hazard Communication standard (8 CCR, 5194) and other Cal/OSHA standards (e.g., asbestos, fall protection, etc.) as appropriate for the project.
- b. All contractor and subcontractor personnel are to be trained to the level of their project assignment in accordance with 8 CCR 1532.1, which at a minimum will require lead awareness training (1-2 hours in length).

2. Respiratory Protection

- a. The Contractor shall provide respiratory protection to all employees where there is the potential for exposure to lead dust at or above the permissible exposure limit per Title 8 5144 Respiratory Protection.
- b. The Contractor's employees who wear a respirator must have passed a fit test within the previous 12 months to perform contract work at the University.

3. Protective Clothing

- a. The Contractor shall provide workers with sufficient sets of protective clothing. Tyvek™, Kleenguard™ or equivalent, coveralls (with hood and feet protection) or equal are acceptable. The Contractor shall also provide coveralls to qualified UCDMC personnel, University Hazardous Material Consultant, State and local officials.
- b. Note that work in sterile areas may require multiple sets of clothing or staging of additional protective clothing to ensure sanitary conditions are maintained.
- c. The Contractor shall provide rubber, latex or Nitrile gloves, rubber boots, eye protection, earplugs and hard hats as needed per the 8 CCR, Hazard Communication and Personal Protective Equipment standards.

4. Medical Surveillance

- a. As required by 8 CCR 1532.1, the Contractor shall establish a medical surveillance program for all employees performing lead work if work is expected to exceed the Action Level for more than 30 days per year. In addition, all personnel required to wear a respirator shall have a medical evaluation to assure they are capable of wearing a respirator per T8 CCR 5144.
- b. The Contractor shall demonstrate all project personnel are participating in the medical surveillance program with evidence supported in the pre-job submittal.

3.8 PERSONAL HYGIENE

A. The Contractor shall require that no employee be allowed to apply cosmetics, or consume food, tobacco products, or beverages in the regulated work area.

B. The Contractor shall establish a location outside the work area, which shall be designated for employee eating and drinking. Employees must utilize the on-site decontamination facilities for clean-up prior to entering the designated eating/drinking location. The eating area shall be kept clean of dust on all horizontal surfaces. Cleaning

stations shall include clean water, soap, and towels. All workers shall clean face, hands and lower arms before leaving the work area for break periods, and at the end of the work shift.

3.9 AIR MONITORING PROGRAM

A. Personal Air Samples - Contractor Responsibility

1. The Contractor shall presume remediation activities will exceed the PEL and conduct initial and daily exposure assessments in accordance with T8 1532.1.
2. Exposure assessments are to be conducted in accordance with 8 CCR 1532.1(d).

B. Area Sampling

1. Daily Perimeter Monitoring – University Hazardous Material Consultant Responsibilities
 - a. The University Hazardous Material Consultant is responsible for monitoring the perimeter of the work zone. Air samples that exceed 30 ug/m³ per 8 hr. TWA require the University Hazardous Material Consultant to halt work and notify the UCDHS EH&S Representative. Work may resume after the Contractor has identified and corrected the work practice that led to the high airborne lead levels.
2. Daily Monitoring – University Hazardous Material Consultant Responsibilities
 - a. The University Hazardous Material Consultant is responsible for monitoring air quality within the regulated area, including the clean room. Any sample at or above 30 µg/M³ TWA in the clean room requires a cessation of work until the area is cleaned and the cause of the problem has been determined and solved. The UCDHS EH&S Representative is to be notified immediately of any such actions. The Contractor shall thoroughly clean the spaces using the HEPA vacuum and wet wiping techniques. Air samples in the work zone that exceed the protection level of a respirator require a cessation of activity. The Contractor's competent person and the University Hazardous Material Consultant shall review work practices with the UCDHS EH&S.

3.10 SPECIFIC WORK PROTOCOLS

A. Specific work protocols, cited below, provide minimum guidance for the performance of site work.

1. Initial Site Clean-Up
 - a. Pre-cleaning is required for this project, where dust and debris will impact setting up the work place control measures.
 - b. LBP/LCM contaminated chips or debris, etc. generated during the project shall be collected while workers are wearing proper respirators and disposable coveralls, and using HEPA vacuums, wet methods, polyethylene bags, lead warning labels and proper disposal protocols.
2. Interim Controls (In-Place-Management)
 - a. This is a control measure to reduce or eliminate lead exposure for less than 20 years. It is not considered abatement. Several strategies are used to control potential exposure to LCM left in place; including, dust removal, paint stabilization, treatment of impact/friction surfaces, and soil coverings. No Interim Controls for lead are included in this project.

- b. Dry blasting LCM is not permitted except by special circumstances pre-approved by the UCDHS EH&S Representative.
 - c. Water blasting LCM surfaces will not be allowed.
- 3. Abatement
 - a. Lead abatement is not planned for this project. Abatement is meant to permanently control LCM products for a period of time greater than 20 years.
 - b. The renovation project may impact lead in building components, but any disturbance to lead in paint must follow the Lead in Construction requirements of 8 CCR 1532.1.
 - c. If the contractor needs to remove paint from surfaces, there are many options to consider including use of paint removal paste (such as Peel Away or equivalent), wet sanding, and HEPA equipped shrouded tools when disturbing LCM surfaces.
 - d. Dry blasting LCM is not permitted except by special circumstances pre-approved by the UCDHS EH&S Representative.
 - e. Water blasting LCM surfaces will not be allowed.

3.11 INSPECTIONS

A. Inspection Responsibilities - Contractor

- 1. Prior to beginning any lead-related work, the Contractor's lead supervisor shall inspect the regulated work areas for any building damage, hazardous conditions and/or irregularities that may contribute to an unsafe work environment. Any condition that poses a hazard or potential hazard to the Contractor's employees or the University's employees, patients and visitors must be immediately reported to the University's Representative.
- 2. The Contractor is responsible for notifying and allowing sufficient time for the University Hazardous Material Consultant to conduct inspections at all phases of the project.
- 3. The Contractor shall establish emergency response protocols for a manometer alarm sounding after they have left the project site. Under no circumstances shall the Contractor shut off negative air machines, unless the project has received final clearance. Dust control requirements under the ICRA Permit will require the work space to be placed under negative pressure for the duration of the demolition phase and new construction phase.
- 4. All waste shall be characterized and separated by the Contractor. Wastes will be sampled individually as directed by the University Hazardous Materials Consultant to determine levels of lead before containerizing for shipment.

B. Inspection Responsibilities – University Hazardous Material Consultant

- 1. The University Hazardous Material Consultant shall walk the project site with the Contractor and the UCDHS EH&S Representative to review scope of work, pre-cleaning operations and any safety or security issues. The University Hazardous Material Consultant may attend the Contractor's safety meetings.
- 2. If minor lead related work requires removal of paint from surfaces using a paste, or work practices using HEPA filtered equipment, the hazard control measures shall be evaluated by the University Hazardous Material Consultant or University EH&S.
- 3. Prior to lead related work activities beginning, the University Hazardous Material Consultant shall match on-site personnel with lead training certificates, fit tests and medical exam records. Workers without on-site documentation shall not be allowed in the regulated area.

4. The University Hazardous Material Consultant is responsible for:
 - a. Reviewing all sampling data and all waste stream profiles.
 - b. Alerting the UCDHS EH&S Representative of any sample result exceeding 30 µg/m³ per 8 hr. TWA.
 - c. Review Contractor's performance and non-compliance report to the Project Manager.
5. The University Hazardous Material Consultant shall file a report of activities with the University's Representative and the UCDHS EH&S Representative on an agreed upon schedule.
6. After abatement or interim control activities are complete, the University Hazardous Material Consultant shall verify completeness of all visible debris is removed.
7. University Hazardous Material Consultant shall review contractor's waste characterization for the most efficient disposal for the University; all recommended disposal processes must be reviewed and approved by the UCDHS EH&S Representative.

3.12 ENCAPSULATION, FINAL CLEAN-UP AND RESTORATION

A. Encapsulation

1. Encapsulation for lead painted components is not anticipated for this project.

B. Final Clean-Up

1. Contractor shall clean entire project area of dust from all surfaces within the construction work area.

C. Restoration

1. Fixtures, equipment or objects relocated to storage areas designated by the University's Representative shall be restored to their exact position. The Contractor assumes full financial responsibility for damage to these objects.

3.13 WASTE DISPOSAL

A. Packaging Lead Waste

1. All lead containing waste material must be packaged and labeled in accordance with U.S. DOT, DTSC and EPA requirements.

B. Storing Lead Waste

1. At the end of each shift, all lead waste shall be stored in a lockable container or shipped off site. Accumulated waste shall not be allowed to remain in the regulated work area overnight. No container shall be allowed to remain at the project site for greater than 90 continuous days from date the first waste container was generated.

C. Uniform Hazardous Waste Manifest Procedures

1. The Contractor or transporter is responsible for providing appropriate Uniform Hazardous Waste Manifests for the transport of hazardous waste materials. Only authorized EH&S personnel can sign on behalf of the UC Davis Medical Center (generator).

D. Transporting Lead Waste to Class 1 Landfill

1. A DTSC registered waste transporter, hired by the Contractor, is responsible for transporting hazardous lead waste from the Medical Center to (Chemical Waste Management, 35251 Old Skyline Road, Kettleman City, CA 93239), an EPA permitted disposal facility. Under certain conditions, UCDHS EH&S will permit hazardous lead waste to be transported to an alternative facility.

2. The transporter shall make pick-ups during normal Working hours - 8:00 AM to 5:00 PM, Monday through Friday. The Contractor must comply with DOT label requirements for their vehicles.
3. The Contractor must make shipments of lead waste containing less than 1,000 mg/kg lead but greater than 350 mg/kg of lead to a Class 1 landfill. This shipment does not require a registered waste hauler.

E. Disposal

1. The selection of a Treatment, Storage and Disposal Facility as an alternative to a landfill for disposal of lead waste must be reviewed and approved by the EH&S representative prior to arranging for the shipment of the waste.
2. The Contractor shall provide waste documents from the Waste Disposal site as verification of the weight and proper disposal site, to the UCDHS EH&S Representative within 15 days of each container disposal.
3. Lead waste that has been contaminated with another hazardous waste (e.g. solvents) must be tested and disposed according to all applicable standards.
4. All lead waste will be sampled for Characterization before determination of Hazardous or Non-Hazardous material is made. Sequence of testing is as follows:
 - a. A TTLC result of $\geq 1,000$ mg/kg is considered a hazardous waste.
 - b. TTLC with a result of ≥ 50 mg/kg of lead must be retested using STLC method.
 - c. A STLC result of ≥ 5.0 mg/l must be retested using TCLP.
 - d. A TCLP result of ≥ 5.0 mg/l deems the waste Federal RCRA.
 - e. A STLC of ≥ 5 mg/l is categorized as State Hazardous Waste (Class 1).
 - f. A TTLC with a result of >350 mg/kg but <5.0 mg/l (STLC and TCLP) must go to landfill permitted to accept this level of lead although it is not hazardous. (See Item 6 below)
5. Contractor shall provide a waste stream report to the University Hazardous Material Consultant identifying the number of containers and an explanation of how the samples were taken (composite or individual container sampling). A waste stream profile must be conducted on each unique waste stream. Confirmation will be provided by the Consultant, indicating all waste streams have been sampled per project specifications.
6. All waste with total lead >350 ppm (mg/kg) disposed of in California, must be disposed of at a permitted Class 1 Hazardous waste landfill, or at other landfills that have specific permits to accept these wastes. However, the wastes are not classed as hazardous wastes unless for a reason other than lead content. The California hazardous waste threshold for total lead is $\geq 1,000$ mg/kg and the soluble threshold concentration (STLC) for lead is ≥ 5 mg/l.

F. Recordkeeping

1. The Contractor shall provide the UCDHS Project Manager with copies of all waste disposal documents.

G. Fees

1. The Contractor is responsible for all fees and charges related to lead waste transport and disposal operations; including, waste stream profiles. Refer to SW-846-1311 (TCLP) and CCR, Title 22 Section 66261 (STLC) for waste stream identification requirements

H. Non-Hazardous Waste Manifest

1. The UCDHS EH&S Representative or Hazardous Materials Consultant (if authorization is provided by UCDHS) is responsible for reviewing and signing non-hazardous waste manifests. Prior to the Representative signing the manifest, the University Hazardous Material Consultant shall inspect the load and confirm its non-hazardous status.

I. Recycled Metals

1. Recycling ferrous or non-ferrous metals with adhered lead paint is encouraged by the UCDHS. The UCDHS expects that lead shielding will be recycled. This section defines "Hazardous Waste" for the purpose of defining waste stream as material that is placed in a land fill. Employee protection regulations remain the same during disturbance of lead. The Contractor is required to remove all loose and flaking paint. The Contractor is responsible for removing all other hazardous material that is unacceptable by the recycling firm. The Contractor is required to recycle where possible. The contractor will obtain a letter from the recycler acknowledging that the recycler is aware of the lead paint and has an Injury Illness Prevention Program (IIPP) that addresses the handling of this material that meets OSHA and EPA regulations. There is no UCDHS requirement for testing (TTLC, STLC, or TCLP) the recycle material stream.

3.14 CLEARANCE PROTOCOL

A. Abatement and Interim Control Projects

1. Lead abatement is not planned for this project; therefore, clearance wipe sampling is not currently planned. If however, there is lead abatement due to an identified lead hazard, the following will be conducted;
2. Prior to any clearance sampling, the regulated areas shall be visually inspected by the University Hazardous Material Consultant for the presence of LBP chips, visible settled dust or debris. Final clearance sampling shall not take place until the area has successfully passed this visual clearance. The Consultant shall follow the U.S. Housing and Urban Development (HUD) clearance wipe sampling protocol, which includes wiping one square foot of the surface being tested using an "S" pattern with an approved commercial lead sampling wipe. Clearance wipe sampling shall be conducted in locations most likely to be contaminated.
2. The University Hazardous Material Consultant and University's Representative following HUD guidelines and CDPH Title 17 requirements shall select the total number of clearance samples for each job site and shall use the Title 17 criteria for clearance purposes.

3.15 PROJECT CLOSE OUT

- A. Before the final certificate for payment is issued to the Contractor the following information shall be provided to the University's Representative:
 1. Using Exhibit 25 Lead Remediation-As-Built Summary (located in the Exhibits section of the Contract Documents) provide "As-Built" summary to include:
 - a. Contractor's name, addresses, CSLB certification number, DOSH registration number, and tax identification number.
 - b. Name of hazardous transporter, address, phone number and registration number.
 - c. ELAP laboratory name(s), addresses, and phone number(s) used to perform AA (flame), TCLP, TTLC or STLC analysis.
 - d. Building name and campus address.

- e. Project name and contract number.
- f. Describe scope of Work; Interim Controls or Abatement and location (room number[s]); provide drawings detailing the areas in which lead work that were accomplished.
- g. Provide an inventory of the LCM/PLCM removed from the project site. Include: building system, quantity, note whether the project was Abatement or Interim Controls, the percentage of the total lead job for each building system type and cost.
- h. Total dollar amount paid by the University for lead-related work including invoice date(s) and date(s) payment received.
- i. Number of employees who worked on the project
- j. Date on-site work began
- k. Date on-site work was completed
- l. Work methods
- m. Did the University provide specification (answer yes or no).
- n. Name, address, phone number and EPA registration number of waste disposal site.
- o. Note that all copies of waste documents from the Waste Disposal site for hazardous material must be received by the University's Representative as part of this section.
- p. The Contractor shall provide copies of all laboratory reports lead work protocols, and disposal documents requested by the University's Representative.
- q. All documents relating to actual employees used for remediation purposes (see Section 3.4, A).

END OF SECTION 02 83 00

SECTION 05 45 00
HEALTHCARE EQUIPMENT SUPPORT SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment support system, accessories,
 - 2. Engineering and fabrication for overhead/ceiling or wall mounted equipment (ESS).

1.2 ACTION SUBMITTALS

- A. Product Data: For each system and component.
- B. Shop Drawings:
 - 1. Indicate plan layout, sections, typical elevations, anchoring methods.
 - 2. Shop drawings shall clearly indicate magnitude and location of all forces transferred to the primary building structure by the equipment support system framing and connections. Loads shall be provided as unfactored values determined in accordance with the IBC and/or ASCE 7.
 - 3. Submit shop drawings to Authority Having Jurisdiction for approval prior to commencing with this work on-site.
- C. Delegated Design Submittal and Shop Drawings: Where professional design services or certifications by a qualified Professional Engineer are specifically required of the Contractor by the Contract Documents, submit shop drawings submittal package with the delegated design submittal requirements in accordance with Section 01 33 23.

1.3 INFORMATIONAL SUBMITTALS

- A. Calculations: Upon request from the Architect/Engineer only, Contractor shall submit calculations in accordance with Section 01 33 00.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Not less than 10 years' experience in the actual production of specified products. Upon request, manufacturer shall submit proof of continuing quality assurance program and shall demonstrate experience with projects of similar size and scope.
- B. Manufacturer Quality Assurance Program: Upon request, manufacturer to submit mill test reports for material furnished to assure that material meets specification criteria.
 - 1. Specifications for Design of Cold Formed Steel Structural Members: AISI.
 - 2. Manual of Steel Construction: AISC.
 - 3. Welding: AWS

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site in original sealed cartons with manufacturer's labels.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Installer shall take field measurements to assure that support system can be installed without interference with structural framing, mechanical systems, plumbing, lighting, fire suppression systems or other obstructions.
- D. Coordination: Coordinate with architectural reflected ceiling plan and mechanical and electrical Drawings. Area directly above support shall be free and clear of obstructions to ensure the support system does not interfere with or dislocate other items. Coordinate with other contractors as required.

PART 2 PRODUCTS

2.1 STRUCTURAL DESIGN REQUIREMENTS

- A. Engineering Responsibility: Engage a qualified Professional Engineer to provide delegated design services in accordance with Section 01 33 23
- B. Structural Performance:
 - 1. Verify loading, deflection criteria and tolerance requirements with equipment supplier. See structural drawings for special loading requirements.
 - 2. Design and construct grid system, including anchorage, to withstand seismic forces in any direction. Refer to Section 01 73 25 for seismic loading criteria and restraint requirements.
 - 3. Provide lateral diagonal bracing, orthogonal in two directions to prevent system from racking **due to seismic forces**.
 - 4. Verify bolting plate assembly requirements with equipment supplier.

2.2 EQUIPMENT SUPPORT SYSTEMS

- A. (ESS) Equipment Support System Manufacturer and Type:
 - 1. Unistrut Corporation:
 - a. Unistrut Metal Framing.
 - b. UMS Boom Supports
 - 2. Cooper B-Line Strut Systems,
 - 3. Hilti USA:
 - a. Hilti Strut Framing.
 - b. Hilti Medical Equipment Supports.
 - 4. Propriety equipment supports systems to be approved by the Architect.
- B. (ESS-1) Universal Grid System: Designed to provide continuous support channels spaced as indicated on the drawings or as required by the equipment supplier.
 - 1. Basis of Design:
 - 2. Locate first and last support channels 4 inches from inside face of walls parallel with universal grid section.
 - 3. Universal grid system designed to provide continuous support channels not more than 2'-1 5/8" on center in each direction and noted on architectural reflected ceiling plan.
 - 4. System to allow attachment of equipment support rails without drilling or welding. Verify rail connection criteria with equipment supplier.
 - 5. For miscellaneous equipment to be installed at grid support system, i.e. exam lights, gas columns and monitor booms, verify bolting plate assembly requirements with equipment supplier.
 - 6. Channel Infill Covers: At grid support structure in reflected ceiling, provide channel infill covers at unused exposed rails. Match exposed framing members color.
- C. (ESS-2) Intermittent System: Two-rail system designed to provide equipment support located and spaced as indicated on the drawings or as required by the equipment supplier.
 - 1. Basis of Design:
 - 2. Provide support channels spaced and located on architectural reflected ceiling plan and as directed by the equipment supplier.
 - 3. System to allow attachment of equipment support rails without drilling or welding. Verify rail connection criteria with equipment supplier.
- D. (ESS-3) Individual Equipment Support System: Equipment support system designed to provide support for individual piece of equipment.
 - 1. Locations, Layout and Spacing: As indicated on Drawings or as required by equipment supplier.

2.3 MATERIALS

- A. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Galvanized steel, ASTM A 653, structural steel, Grade 33, with G90 coating.

2. Material: Cold-rolled steel, ASTM A 1008, structural steel, Grade 33; hot-dip galvanized after fabrication.
- B. Fittings: Formed or stamped steel nuts, bolts, washers and other devices designed to fit into channel slot and prevent slipping along channel.
 1. Fitting Material: ASTM A575, A576, A635 or A36.
 2. Bolt & Nut Material: Regular hexagon-head bolts, ASTM A307 Grade A; hex nuts ASTM A563; and where indicated, flat washers.
 3. Plain Washers: Round carbon steel, ASME B 18.22.1
 4. Lock Washers: Helical, spring type, carbon steel, ASME B 18.21.1
- C. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- E. Finishes:
 1. Concealed Framing Members: Electro-Deposition Acrylic Coating, ASTM B117 or Pre-galvanized per ASTM A653 G90.
 2. Concealed Fittings: Hot-dipped galvanized per ASTM A123 or A153.
 3. Exposed Framing Members: Electro-Deposition Acrylic Coating, ASTM B117.
 - a. Color: White (or other) to match suspended acoustical ceiling grid system color.
 4. Exposed Fittings: Finish to match exposed framing members.

2.4 INSTALLATION ACCESSORIES

- F. Embedded Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches 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.
- A. Power-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- C. Expansion Anchors: Anchor bolt and sleeve assembly (carbon-steel components zinc-plated to comply with ASTM B633) with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
 1. Do not proceed until unsatisfactory conditions have been corrected.
- B. Field Measurements: Take field measurements; report interferences with structural framing, mechanical systems, or other obstructions to Architect/Engineer and general contractor.

3.2 INSTALLATION

- A. Install equipment support system and accessories in accordance with reviewed Shop Drawings and in accordance with equipment manufacturer's requirements.

- B. Set system accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Tighten all connections to their recommended torque values.
- C. Provide anchorage devices and fasteners for securing equipment support systems to in-place construction.
 - 1. Attach to structure by means of imbedded concrete inserts, through bolts or by direct attachment to structural framing.

3.3 INSTALLED WORK

- G. Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- H. Trim excess length of continuous-thread hanger and support rods to not less than 1-1/2 inches.
- I. Protection: Protect installed work from damage and alteration for remainder of construction.

END OF SECTION

SECTION 05 50 00 METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous metal, except structural steel framing as structural steel in AISC "Code of Standard Practice":
 - a. Steel framing and supports for ceiling-hung toilet compartments, partitions, overhead doors and grilles, countertops, mechanical and electrical equipment, and other applications where framing and supports are not specified in other Sections.
 - b. Miscellaneous steel trim including steel angle corner guards, steel edgings, loading-dock edge angles, and support for elevator door sills.
 - c. Loose bearing and leveling plates for applications where they are not specified in other Sections.
1. Metal Fabrications:
2. Surface preparation and priming for finishes on ferrous metal, performed in shop:
 - a. Surface preparation;
 - b. Galvanizing;
 - c. Shop primer for paint;
 - d. Shop primer for high-performance coatings;
2. Engineering required to comply with specified performance requirements.

1.2 COORDINATION

- A.** Coordinate installation of anchorages for metal fabrications. 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.

1.3 ACTION SUBMITTALS

- A.** Shop Drawings: Indicate dimensions, description of materials and finishes; include plans, elevations, sections, and details of metal stairs and ladders and their connections and reactions to building structure. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections, and installation procedures, including specific requirements indicated.
1. Indicate design criteria and applied loading for which metal fabrications have been designed.
 2. Clearly indicate magnitude and location of all forces transferred to the primary building structure by metal fabrications. Loads shall be provided as unfactored values determined in accordance with ASCE 7-10.
 3. Construction details, sizes of metal sections, thickness of metals, profiles, attachments, dimensions and field joints, method of support from structure, and finishes.
 4. Work to be built-in or provided by other Sections.
 5. Welding: Indicate welded connections, both shop and field, using standard AWS welding symbols. Indicate net weld lengths.
 6. Shop drawings shall be signed and sealed by the qualified professional engineer responsible for their preparation.
 7. Deferred-Design Submittal: Submit shop drawings to Authority Having Jurisdiction for approval prior to commencing with this work on-site.

1.4 INFORMATIONAL SUBMITTALS

- A.** Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

- B. Calculations: Signed engineering calculations shall be submitted upon written request from the Architect/Engineer. Calculations shall indicate structural integrity of members, anchors, fasteners and connections to building structure, in accordance with specified criteria.
 - 1. Engineering Responsibility: Calculations shall be reviewed for stated design assumptions, general compliance to specified requirements, and forces imposed on structure. The accuracy of the design calculations shall be the sole responsibility of the Contractor's Professional Engineer.
 - 2. Submitted calculations that have not been requested by the Architect/Engineer shall be returned without review.

1.5 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: Professional engineer who is legally qualified to practice in the State of Minnesota and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of metal stairs and ladders (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent
- B. Fabricator Qualifications: Firm experienced in producing metal stairs similar to those indicated for this Project and with record of successful in-service performance, as well as sufficient production capacity to product required units.
- C. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by same firm.
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code-Sheet Steel."
- E. Mockup: Prior to commencing fabrication of final work, build mockup of (MET FAB-25) to demonstrate constructability and execution of fabrication.

1.6 HANDLING AND STORAGE

- A. Load, unload, handle and store work in manner that will not bend, deform or otherwise damage metal. Store so metal and shop coats will not be subject to weather or moisture, store off ground and provide covering for metal in storage.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: **120 deg F**, ambient; **180 deg F**, material surfaces.

2.2 STRUCTURAL DESIGN REQUIREMENTS

- A. Engineering Responsibility: Engage a qualified Professional Engineer to provide delegated design services in accordance with Section 01 33 23

2.3 MATERIALS

- A. Materials, General:
 - 1. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2. Recycled Content of Ferrous Metals: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel:
1. Rolled-Steel Floor Plate: ASTM A 786 rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.
 2. Sections, Plates, Sheet and Bars: Structural quality steel; ASTM A36 and ASTM A440 where high strength steel is required.
 3. Steel Plates, Shapes and Bars: ASTM A36.
 4. Steel Tubing: ASTM A501 or ASTM A500.
 5. Steel Pipe: ASTM A53, Type S, Grade A, standard weight and extra-strong as required, galvanized and plain.
 6. Galvanized Sheet Metal: ASTM A526 or A527, G-90 coating designation with both sides of metal prime painted.
 7. Galvanizing: ASTM A123, hot dip galvanizing, thickness Grade 55 unless otherwise indicated.
- C. Welding Materials: Applicable AWS D1.1, type required for materials being welded.
- D. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required
1. Bolts, Nuts and Washers: High strength steel hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
 2. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, load equal to 6 times load imposed when installed in unit masonry and equal to 4 times load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by qualified independent testing agency.
 - a. Material: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
 3. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329
- E. Concrete Materials and Properties: Comply with requirements in Section 033000 - Cast-in-Place Concrete for normal-weight, ready-mixed concrete with minimum 28-day compressive strength of 3000 psi, unless higher strengths are indicated.

2.4 METAL FABRICATIONS AND ASSEMBLIES

- A. (MET FAB-2) Interior Steel Ladder:
1. Comply with ANSI A14.3, unless otherwise indicated.
 2. Height as indicated on Drawings.
 3. Siderails: Continuous, 3/8 by 2-1/2 inch steel flat bars, with eased edges. Space siderails 16 inches apart, unless otherwise indicated.
 4. Rungs: 3/4 inch diameter steel bars at 12 inches on center.
 5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 6. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
 7. Support each ladder at top and bottom, and not more than 60 inches o.c. with welded or bolted steel brackets.
 8. Finish: Shop-prime for field-painted finish (PT).
- B. (MET FAB-7) Bollard for Door Operators: Fabricate metal bollards from galvanized steel channels, as indicated.
1. Where bollards are indicated to receive controls for door operators and card readers, provide cutouts for controls and holes for wire.
 2. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.
 3. Finish: Shop-prime for high-performance coating (HPC).

- C. (MET FAB-8) Bollards Imbedded in Concrete: Hot-dipped galvanized steel pipe, 6 inch dia., 7 feet long, concrete filled, crowned cap, prime paint finish only the exposed top 3'-6".
 - 1. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
 - 2. Fill bollards solidly with concrete, mounding top surface to shed water.
 - 3. Finish: Shop-prime for high-performance coating (HPC).
- D. Shelf Angles and Relief Angles: Fabricate shelf angles and relief angles from steel angles of sizes indicated and for attachment to steel and concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
 - 3. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
 - 4. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.
 - 5. Finishes:
 - a. Interior: Shop-applied primer and field-painted (PT).

2.5 EQUIPMENT SUPPORT SYSTEM

- A. (ESS-1) Type and Manufacturer: Unistrut framing by Unistrut Products.
- B. Other Acceptable Manufacturers: B-Line Systems, Grinnell Power Strut.
- C. Framing Material: ASTM A570 Grade 33 or ASTM A446 Grade A, G90.
- D. Finish:
 - 1. Framing Members and Fittings: Corrosion resistant acrylic paint per Federal Standard 5950. (Galvanized per ASTM A525, G90).
 - 2. Hardware: Electro-galvanized per FS QQ-Z-325A, Type 1, Class 3.

2.6 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 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 and contour of welded surface matches that of adjacent surface.
- 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 will be 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.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.
- J. Miscellaneous Framing and Supports: Fabricate 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.

2.7 FINISHING

- C. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- D. Stainless Steel:
 - 1. Finish designations prefixed by AISI shall conform with the system established by the American Iron and Steel Institute for designating finishes for stainless steel sheet.
 - 2. Bright, Directional Polish: AISI No. 4 finish.
- E. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. Hot Dip Galvanizing for Shapes and Plates: ASTM A123, for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips 0.0299 inch thick and heavier.
 - 2. Hot Dip Galvanizing for Bolts and Similar Threaded Fasteners: ASTM A153, for galvanizing steel and iron hardware.
 - 3. Galvanizing Touch-Up Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
 - 4. At railings to be hot-dipped galvanized after fabrication: Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- F. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed products:
 - 1. Exterior (SSPC Zone 1B): SSPC SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interior (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."
 - 3. Do not apply primer to galvanized surfaces.

PART 3 EXECUTION

3.0 EXAMINATION

- A. Examine areas and conditions under which miscellaneous metal items are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.1 INSTALLATION

- A. Provide setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- C. Perform cutting, drilling and fitting required for installation of miscellaneous metal items. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.
- D. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch up shop paint coat. Do not weld, cut or abrade surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- F. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 2 mils.
- G. 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.
- H. 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.
- I. 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.
- J. 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.
- K. 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.

END OF SECTION

SECTION 06 40 00 ARCHITECTURAL WOODWORK

Section Revised DSI0004, 27 AUG 2021

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic-Laminate-Faced Cabinets and Countertops (PLAM)
 - 2. Requirements for Fabrication and Installation.
- B. Related Sections:
 - 1. Section 055000 - Metal Fabrications: Metal supports for woodwork.
 - 2. Section 099000 - Painting: Field-finishing of woodwork.
 - 3. Division 22 - Plumbing and Division 26 - Electrical sections for coordination with cabinetwork.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work directly with Work of other Sections as necessary to ensure proper fitting, joining or required clearances of other work.
 - 1. Exchange and coordinate shop drawings and templates.
 - 2. Coordinate fabrication schedule.
 - 3. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

- A. Product Data: For each material and product to complete Work, including; solid hardwood, panel and veneer wood products, core materials, high-pressure decorative laminate, solid-surfacing, fire-retardant-treated materials, cabinetwork and hardware, components for wood fabrications, accessories and finishing materials.
- B. Shop Drawings: Indicate dimensions, descriptions of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, including specific requirements where indicated.
 - 1. Indicate materials and wood species, component profiles, fastening, jointing, details, finishes and accessories.
 - 2. For Work to receive matched wood veneers, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 4. Indicate special requirements for field assembly and installation, including field connection locations, required clearances and tolerances.
 - 5. Indicate provisions for attachment of architectural woodwork and other components performed by others in the field.
 - 6. Indicate locations of plumbing and electrical service field conditions.
- C. Samples: Submit full-size units or Samples of sizes indicated, prepared from same material to be used for the Work, with shop-applied transparent finish, that show full range of color and texture variations expected.
 - 1. (PLAM) Plastic Laminates .
 - 2. Accessories and Hardware: Submit samples of hardware, accessories, and components of wood fabrications and casework.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Fabricator and Installer.
- B. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator and Installer Qualifications:
 - 1. Fabricator Qualifications: A well-established and experienced fabricator, acceptable to Owner and Architect, employing skilled workers to custom-fabricate millwork, casework and other architectural woodwork similar to that required for this Project, whose Work meets or exceeds quality requirements of specified NAAWS Grade, and whose completed Work has a record of successful in-service performance.
 - 2. Installer Qualifications: A well-established installer with experience installing millwork, casework, finish carpentry work, and other custom-fabricated woodwork similar to that required for this Project, whose Work meets or exceeds quality requirements of specified NAAWS Grade, and whose completed Work has a record of successful in-service performance.
 - 3. Architect reserves the right to reject woodwork fabricator if it is Architect's opinion that previous performance by fabricator has been unsatisfactory, or if any of the following will not result in required quality within time required for completion:
 - a. Shop capacity.
 - b. Experience of workers.
 - c. Equipment or supply of material.
 - d. Previous performance by manufacturer has been unsatisfactory.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with American Welding Society's AWS D1 "Structural Welding Code."

1.6 SITE CONDITIONS

- A. Delivery, Handling and Storage: Protect woodwork items from damage, dust and dirt. Do not deliver, receive, store or install woodwork materials until storage and installation areas are conditioned in accordance with requirements and recommendations of NAAWS.
- B. Environmental Requirements: Use permanent HVAC system or provide temporary systems and controls to establish and maintain site conditions complying with specified requirements.
 - 1. Do not deliver, receive, store or install architectural woodwork until building is enclosed, wet work is complete, and temporary or permanent HVAC systems are operating in areas where woodwork is stored and installed and are maintaining temperature and relative humidity at occupancy levels and within the following ranges during the remainder of the construction phase:
 - a. Temperature Range: Between 60 and 90 deg F.
 - b. Relative Humidity Range: Between 25 and 55 percent.
 - 2. Fluctuation of Temperature and Relative Humidity Levels:
 - a. Do not exceed 15 percent fluctuation over any portion of a 7-day period and not to exceed 25 percent fluctuation over any portion of a 28-day period.
 - b. Maintain operation and control of heating, cooling, humidity, ventilation, temporary barriers and similar facilities continuously on a 24-hour basis to avoid rapidly fluctuating ambient levels.
 - 3. Site Conditions Report: Monitor temperature and relative humidity in areas where woodwork is stored and installed at Project site. Record temperature and relative humidity prior to delivery, throughout storage period and installation, and after installation until time of Substantial Completion. Report recorded values in accordance with Submittals requirements.
- C. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Acoustical Performance Requirements for Architectural Woodwork in Acoustically-Critical Spaces:
 1. Comply with requirements of Section 018198 - Facility Acoustic Performance Requirements.
 2. The following characteristics are not acceptable or permitted in final installed Work:
 - a. Vibration harmonics, buzzing, rattling or squeaking.
 - b. Noises caused by movement of components;
 - c. Loosening, weakening, or fracturing of system components or attachments.

2.2 ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standards: Provide custom-fabricated architectural woodwork, casework and other architectural woodwork fabricated and installed in accordance with specified Grade classification of the *North American Architectural Woodwork Standards, Adopted and Published jointly by Architectural Woodwork Institute, Architectural Woodwork Manufacturer's Association of Canada and Woodwork Institute - Current Edition (NAAWS)*.
 1. Comply with specified NAAWS Grade except where more stringent requirements are required by NAAWS.

2.3 WOOD MATERIALS

- A. General: Provide specified wood materials and other materials recommended by woodwork fabricator, and in compliance with specified NAAWS Grade.
 1. Wood Moisture Content: 8 to 13 percent.
 2. Provide wood products made with binder containing no urea formaldehyde,
 3. Dimensions: As indicated on Drawings.
 4. Fire-Retardant-Treated Materials: Where fire-retardant-treated materials are indicated, use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
- B. Miscellaneous Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- C. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber .
- D. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
- E. Hardboard: AHA A135.4.
- F. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
- G. Softwood Plywood: DOC PS 1, exterior.
- H. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
- I. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

2.4 LAMINATE-FACED CABINETS AND COUNTERTOPS

- A. Minimum Quality Standard: Unless otherwise indicated, comply with the *North American Architectural Woodwork Standards* (NAAWS) for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Plastic-Laminate-Faced Cabinets: NAAWS Custom Grade for cabinets.
 - 1. (PLAM) Basis of Design: Refer to Material Identification List.
 - 2. Type of Construction: Frameless.
 - 3. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
 - 4. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 5. Exposed Horizontal and Vertical Surfaces: Grade HGS.
 - 6. Edges: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
 - 7. Semi-Exposed Surfaces (Other than Drawer Bodies): Thermoset Decorative Panels consisting of particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 - a. Medium-Density Fiberboard: ANSI A208.2, Grade 130 made with binder containing no urea formaldehyde.
 - b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
 - 8. Semi-Exposed Backs of Panels: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - 9. Concealed Backs of Panels: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
 - 10. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - a. Join subfronts, backs, and sides with glued dovetail joints.
 - b. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 - c. Drawer Bottoms: Thermoset decorative panels.
- C. Plastic-Laminate Countertops: NAAWS Premium Grade for architectural countertops on base cabinets, wall-mounted countertops and shelves.
 - 1. (PLAM) Basis of Design: Refer to Material Identification List.
 - 2. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS ; post forming grade (0.039" thick) High Pressure laminate counter top.
 - 3. Edge Treatment: Post-formed, matching laminate in color, pattern, and finish.
 - 4. Backsplash: As shown on Drawings.
 - 5. Core Board for Countertops: 1-inch thick, medium-density fiberboard made from 100% recycled fiber meeting ANSI 208.2 standards, ASTM D1037 2, Grade2-M-2 and HUD 24 emission standards (formaldehyde free).
 - a. Medex MD Exterior by Medex Corporation
 - b. AllGreen PR MDF by CanFibre Group Ltd
 - 6. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.5 CABINET HARDWARE AND ACCESSORIES

- B. (CWKA) Casework Hardware and Accessories: As specified below and as indicated on Material Identification List.
- A. Hinges, Knuckle: BHMA A156.9, B01361, fixed pin, five knuckle steel hinges, dull chrome, 2-3/4 inch by 0.095 thick.
- B. Hinges, Concealed: BHMA A 156.9 B01602, concealed, all-metal hinges, 110 degree opening (unless otherwise noted) self-closing, 3-way adjustable.
 - 1. Basis of Design: Grass Nexis.

2. Provide 3 per leaf over 48 inches high, 2 per leaf elsewhere. .
 3. Closers: Provide Quiet Soft-Cushion Closers: Nexis G-Force Soft Closer.
- C. Door and Drawer Pulls: Aluminum, matte silver finish.
1. Basis of Design: No. 106.74.913 by Häfele.
- D. Drawer Slides: BHMA A156.9, cold rolled steel, zinc plated with positive stop and full extension. Rolling steel balls, nylon rollers meeting or exceeding the following requirements, unless otherwise indicated:
1. Minimum 75 lb. load rating, for use at drawers 16-inches wide or less.
 2. Minimum 100 lb. load rating, for use at drawers 24-inches wide or less.
 3. Minimum 150 lb. load rating, for use at drawers greater than 24-inches wide, at deep drawers, and drawers with file folder racks.
- E. Door Locks: BHMA A156.11, E07121.
- F. Drawer Locks: BHMA A156.11, E07041.
- G. Shelf Rests, Typical: BHMA A156.9, B04013; metal.
- H. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- I. Cable Passage Grommets: Provide cord grommets in diameter shown, and in color as selected by Architect.
1. (CWKA-1) Plastic Grommet Liner and Cap: SG Series or EDP Series by Doug Mockett.
- J. Glass Lites for Cabinetwork Doors: (GL-1T) fully-tempered clear float glass; 1/4-inch thickness; ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), and heat-treated to comply with ASTM C1048, Kind FT (fully tempered); with ground and polished flat edges.

2.6 INSTALLATION ACCESSORIES

- A. Installation Accessories: Provide assembly hardware as shown on Drawings, or as recommended by Fabricator and approved by Architect.
- B. Mechanical Fasteners and Anchors: Use material, type, size and finish required for each substrate for secure anchorage and as recommended by architectural woodwork fabricator and installer.
1. Provide concealed anchors unless otherwise indicated.
 2. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
 3. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde. VOC Limits for Installation Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
 2. Wood Glues: 30 g/L..
 3. Multipurpose Construction Adhesives: 70 g/L.
 4. Contact Adhesive: 80 g/L.

2.7 FABRICATION

- A. General: Fabricate Work of this Section using materials, methods and quality control procedures in accordance with NAAWS, and in accordance with reviewed Shop Drawings.
1. Complete fabrication in shop, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site.
 2. Join and assemble work to provide durable, strong, rigid units that will not warp or rack, including during shipping and installation.
 3. Disassemble components only as necessary for shipment and installation. Allow for easy handling and passage through building openings.
 4. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

- B. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- C. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- D. Metal Framing and Supports:
 - 1. Welded Connections: Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.
 - 2. Non-Welded Connections: Fabricate for interconnection of members by means of mechanical fasteners and fittings unless otherwise indicated.
- E. Shop Finishing: Pre-finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
 - 1. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
 - 2. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces. Concealed surfaces of plastic-laminate-clad paneling do not require backpriming when surfaced with plastic laminate.
 - 3. Primer Application on Steel Framing: Apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examination and Acceptance of Conditions: Before proceeding with installation, take field measurements, examine substrates and verify temperature and relative humidity and other conditions.
 - 1. Verify that mechanical and electrical items affecting this section are properly placed, complete, and have been inspected by Architect prior to commencement of installation.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected and after building temperature and relative humidity are within specified range. Proceeding with the Work indicates acceptance of surfaces and site conditions.
- B. Material Moisture Content and Environmental Requirements: Install products at the time and under conditions that will ensure the best possible results and maintain conditions until Substantial Completion.
 - 1. Comply with recommendations of Architectural Woodwork Standards.
 - 2. Conditioning: Before installation, condition wood materials and cabinets in accordance with specified site condition requirements.
 - a. Do not install unconditioned woodwork.
 - b. Reject materials that are wet, moisture damaged or mold damaged.
- C. Substrate: Before proceeding with installation, examine substrate to receive work for compliance with requirements for installation tolerances and other conditions affecting performance. Installer must approve substrate prior to installation.
- D. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product.

1. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
2. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
3. Verify space requirements and dimensions of items shown diagrammatically on Drawings.

3.2 INSTALLATION

- A. General: Install architectural woodwork in accordance with *North American Architectural Woodwork Standards* (NAAWS) and in accordance with reviewed shop drawings and manufacturer instructions.
 1. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
 2. Install free from hammer or tool marks, open joints or slivers or other defects detrimental to appearance or performance.
 3. Set plumb, level, square and true to dimensions shown and required. Allow for finishes and proper clearances where necessary. Use concealed shims where required for alignment.
 4. Tolerances: Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining work with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 5. Scribe and cut to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 6. Coordinate with materials and systems in or adjacent to woodwork and provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
 7. Shop-Fabricated Work: Before installing, examine shop-fabricated work for completion. Assemble shop fabricated work and complete fabrication at Project site to the extent that it was not completed in the shop. Backprime unfinished surfaces that are concealed when installed.
 8. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Anchorage: Adequately anchor, fasten and support members to form secure, substantial and accurate work and to hold required dimensions and prevent twist.
 1. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
 2. Provide blocking, attachment plates, anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work.
 3. Provide anchorage type required to allow movement of wood due to changes in relative humidity without permanent damage to the wood and other components.
- C. Joints: Fit exposed connections together to form hairline joints. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect as determined by Architect.
 1. Provide joints to accommodate expansion of woodwork due to changes in relative humidity.
- D. Cabinetwork Installation: Install cabinets to comply with same NAAWS Grade as item was fabricated.
 1. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 2. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork. For shop finished items use filler matching finish of items being installed.
 3. Countertops: Anchor securely to base units and other support systems as indicated.
 4. Maintain veneer sequence matching of cabinets with transparent finish.

3.3 INSTALLED WORK

- A. Damaged or Non-Compliant Woodwork: Remove and replace materials that are damaged or do not comply with requirements.

1. Damaged woodwork may be repaired or refinished if resulting repair work complies with requirements and shows no evidence of repair or refinishing.
 2. Remove and replace woodwork materials that are wet, moisture damaged, or mold damaged.
 3. Replace, at no additional cost to Owner, materials that are damaged or that cannot be cleaned to satisfaction of Owner.
- B. Adjusting: Adjust movable components of assembly to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range, and without binding or damaging assembly components. Lubricate hardware and moving parts. Adjust joinery for uniform appearance.
- C. Cleaning: Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.
1. Clean interior finish carpentry on exposed and semi-exposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.
 2. Clean cabinetwork, counters, shelves, hardware, fittings and fixtures.
- D. Protection: Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
1. Comply with specified requirements for temperature and relative humidity.
 2. Protect installed products from damage from weather, moisture, dust, dirt and other causes during construction.
- E. Demonstration and Training: Instruct Owner's personnel to operate, adjust and maintain operable components of woodwork assemblies.

END OF SECTION

SECTION 07 21 00 THERMAL INSULATION

GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concealed building insulation.
 - 2. Loose-fill building insulation.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E84.
 - 2. Fire-Resistance Ratings: ASTM E119.
 - 3. Combustion Characteristics: ASTM E136.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PRODUCTS

1.5 MATERIALS

- A. (INSUL-20) Batt or Blanket Insulation: ASTM C665; Type I (blankets without membrane facing); consisting of fibers manufactured from glass; conforming to the following:
 - 1. Nominal density of 1.0 lb/cu. ft., thermal resistivity of 3.7 deg F x h x sq. ft./Btu x in. at 75 deg F
 - 2. Fire Characteristics:
 - a. ASTM E 84:
 - 1) Maximum flame-spread of 25
 - 2) Maximum smoke-developed indices of 50
 - b. ASTM E 136: Passes.
 - 3. Thickness: Same as stud depth or as indicated.
 - 4. Width of Batts: Center to center dimension of metal studs and full face to face at other voids.
 - 5. ASTM C665; Type I Class A.

- B. (INSUL-21) Fiberglass Batt or Blanket Insulation with Foil Facing: ASTM C665; Type III Class B and C, foil-faced fiberglass batt insulation with integral vapor barrier; conforming to the following.
 1. Fire Characteristics:
 - a. ASTM E84:
 - 1) Maximum flame-spread of 25
 - 2) Smoke-developed indices of 50
 2. Thickness: Same as stud depth or as indicated.
 3. Width of Batts: Center to center dimension of metal studs and full face to face at other voids.
 - C. (INSUL-22) Flame Resistant, Foil-Faced, Flexible Glass-Fiber Board Insulation: ASTM C612, Type III or ASTM C 553, Types II, Class A; faced on one side with polypropylene foil-scrim-kraft facing; designed for exposed applications and of the following properties:
 1. Nominal density of not less than 1.5 lb/cu. ft. nor more than 1.7 lb/cu. ft., thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F.
 2. Fire Characteristics:
 - a. ASTM E84:
 - 1) Maximum flame-spread of 25
 - 2) Maximum smoke-developed indices of 50
 - b. ASTM E 136: Passes.
 3. Thickness: Same as stud depth or as indicated.
 4. Width of Batts: Center to center dimension of metal studs and full face to face at other voids.
 5. Acceptable Manufacturer:
 - a. Johns Manville: FSK-25
 - b. Owens Corning: Flame Spread 25 FRK
 - c. Meet NFPA 285.

1.6 OTHER

- A. (INSUL-34) Glass-Fiber Loose-Fill Insulation: ASTM C764, Type 1, pneumatic application; with maximum flame-spread and smoke-developed indices of 5, per ASTM E84.

1.7 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
 1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 2. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105 inch (2.67 mm) in diameter, length to suit depth of insulation indicated.
 3. Manufacturers and Products:
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Eckel Industries of Canada Limited; Stic-Klip Type N Fasteners.
 - c. Gemco; Spindle Type.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
 1. Angle: Formed from 0.030-inch-thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
 2. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105 inch in diameter, length to suit depth of insulation indicated.
 3. Manufacturers and Products:
 - a. Gemco; 90-Degree Insulation Hangers.

- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 - 1. Manufacturers and Products:
 - a. AGM Industries, Inc.; RC150.
 - b. AGM Industries, Inc.; SC150.
 - c. Gemco; Dome-Cap.
 - d. Gemco; R-150.
 - e. Gemco; S-150.
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of dimension indicated between face of insulation and substrate to which anchor is attached.
 - 1. Manufacturers and Products:
 - a. Gemco; Clutch Clip.
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
 - 1. Manufacturers and Products:
 - a. AGM Industries, Inc.; TACTOO Adhesive.
 - b. Gemco; Tuff Bond Hanger Adhesive.

EXECUTION

1.8 INSTALLATION, GENERAL

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

1.9 INSTALLATION QUALITY

- A. Install rigid insulation to maintain continuous and complete thermal protection for building spaces and elements.
- B. Ensure surfaces which are to receive rigid insulation are clean, free of deleterious matter and are sufficiently level to allow proper installation of insulation.
- C. Cut and trim insulation neatly to fit spaces. Butt edges and ends tight. Fit insulation tight against mechanical, electrical and other items which protrude through plane of insulation.
- D. Use insulation free of broken or chipped edges.

1.10 PREPARATION

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

1.11 BATT INSULATION INSTALLATION

- A. Install batt and blanket insulation (INSUL-20) and (INSUL-24) in accordance with manufacturer's instructions.
- B. Trim insulation neatly to fit spaces which are less than stud spacing.
- C. Fit insulation tight within spaces and tight to and behind mechanical and electrical services within plane of insulation. Leave no gaps or voids.

1.12 BATT INSULATION INSTALLATION

- A. Install batt and blanket insulation (INSUL-21) in accordance with manufacturer's instructions.
- B. Fit insulation tight within spaces and tight to and behind mechanical and electrical services within plane of insulation. Leave no gaps or voids.
- C. Tape joints to seal foil facing with foil tape.

1.13 LOOSE- FILL INSULATION

- A. Apply loose-fill insulation (INSUL-34) according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

1.14 PROTECTION

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

END OF SECTION

SECTION 07 81 00 APPLIED FIREPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Patching and replacement of existing fireproofing materials that are disturbed, remove or damaged during construction activities.
 - 2. Preparation of substrates.
 - 3. Wet-mix sprayed fireproofing (FP).
 - 4. Patching and repairs.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- C. Samples: For each exposed product and for each color and texture specified, 4 inches square in size.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Preconstruction Test Reports: For fireproofing.
- E. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.
 - 1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is **44 deg F** or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAY-APPLIED FIRE-RESISTIVE MATERIALS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Sprayed-on Fire-resistant Coating: Cementitious fireproofing, Wet-mix setting based type as defined by Underwriters Laboratories and free from asbestos, actinolite, amosite, anthophyllite, chrysotile and tremolite. No mineral fiber fireproofing allowed.
 - 1. Cementitious Wet Mix Admixtures: Materials (with and without aggregate) which, when mixed in accordance with accompanying instructions forms a slurry or mortar providing properties necessary for conveyance and application to building structures.
 - 2. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Steel members are to be considered unrestrained unless specifically noted otherwise.
 - b. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method. UL design listings requiring a load restriction factor are not allowed.
 - 3. VOC Content: Products shall comply with VOC
- C. (FP-1) Standard Density: Meeting or exceeding 15 pounds per cubic foot per ASTM E605, no fungal growth per ASTM G21. For concealed locations and in plenum ceilings and above suspended ceilings.
 - 4. Products and Manufacturers:
 - a. Monokote MK-6 by Grace Construction Products.
 - b. Pyrolite 15 by Carbolite Fireproof Products Division.
 - c. Caico-300 by Isolotek.
 - d. Southwest Fireproofing Type 5GP by AD Fire Protection Systems.
- D. (FP-2): Provide medium density material meeting or exceeding 22 pounds per cubic foot per ASTM E605, no fungal growth per ASTM G21 and also containing 50 percent cement content by weight minimum. For exterior concealed areas, exposed locations on columns, beams, and roof deck in mechanical and electrical rooms, penthouses, data rooms, elevator rooms and shafts, non-ducted air shafts, equipment rooms, and other service type rooms and where indicated.
 - 5. Grace Construction Products, Monokote Z-106.

6. Pyrolite 22 by Carbolite Co., Fireproofing Products Division.
 7. Carbolite Co., Fireproofing Products Div.; Pyrocrete 239.
 8. Isolatek International Corp.; Cafco 400.
 9. Pyrok-MD by Pyrok, Inc.
 10. Southwest Fireproofing Type 5MD by AD Fire Protection Systems.
- C. Mixing: Perform mixing and preparation of materials at project using mechanical equipment, in accordance with manufacturer's printed directions to achieve performance criteria specified herein.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- B. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- C. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- D. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- E. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- F. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.
- G. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.
 1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.
- H. Water: Potable, fresh and free from organic and mineral impurities which would affect set of sprayed fireproofing materials.
- I. Adhesive for Bonding Fireproofing: Type recommended by manufacturer of sprayed-on fireproofing manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to which this work is to be attached or applied and notify Architect if conditions exist which are detrimental to proper and expeditious installation of work. Starting of work shall imply acceptance of substrate for adhesion and performance of work as specified. Substrate is in satisfactory condition if it complies with following :

1. Substrate complies with requirements of section in which substrate and related work is specified and is free of oil, grease, rolling compounds, incomplete primers, loose mill scale, dirt or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
 2. Objects which will penetrate fireproofing, including clips, hangers, support sleeves and similar items have been securely attached to substrates.
 3. Substrates are not obstructed by ducts, piping, equipment and other suspended construction that could interfere with application of fireproofing and until it has dried.
- B. Cooperate with coordination and scheduling of work of this section with work of other sections so not to delay job progress.
- C. Clips, hangers, supports, sleeves and other attachments to fireproofing bases, as covered under other sections of specifications, are to be placed by other trades prior to application of fireproofing material, where these materials can be anticipated in advance.
- D. Ducts, piping or conduit or other suspended equipment that could interfere with uniform application of fireproofing material are to be positioned after application of sprayed fireproofing, unless fireproofing applicator agrees to their installation prior to fireproofing.
- E. Prior to application of fireproofing material, ascertain that steel is acceptable to receive fireproofing. Steel shall be free of oil, grease, loose mill scale, or other substance that may impair proper adhesion.

3.2 SURFACE PREPARATION

- A. Clean surface to receive sprayed fireproofing to remove mill scale, dirt, grime, oil, grease, dust, loose rust, rolling compounds, incompatible primers and other foreign material which will impair satisfactory bonding of fireproofing to substrate.
- B. Cover other work which might be damaged by fallout or overspray of fireproofing materials during application. Provide temporary enclosure as may be required to confine operations, protect environment, and to ensure adequate ambient conditions for temperature and ventilation.
- C. Notify Contractor of surface condition which cannot be corrected by normal cleaning methods and requires correction of conditions prior to application of sprayed fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Commencement of application of fireproofing shall be deemed as acceptance by applicator of suitability of surface to receive work and acceptance of responsibility for failure of bond between fireproofing and substrate.
- D. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Apply spray fireproofing using manufacturer's authorized installer in accordance with manufacturer's directions and instructions and in conformance with city and state codes, regulations and requirements having jurisdiction. Qualified manufacturer's representative shall be present for initial application to guide and assist applicator's personnel.
- C. Sprayed Fireproofing: Apply to areas and surfaces which are scheduled to be fireproofed and to proper thicknesses to achieve fireproofing hours.
1. Control thickness of fireproofing by utilizing workable depth gauge to assure that minimum thickness has been applied.

- D. Ventilation: Make provisions to properly dry fireproofing after application. In enclosed areas lacking natural ventilation, provide mechanical air circulation and ventilation.
- E. Equipment, Mixing and Application: In accordance with manufacturer's written specification and application instructions. Mechanically control material and water ratio on project site.
- F. Qualified Personnel: Provide to supervise application.
- G. Bonding Adhesive: Apply to underside of steel roof deck units which do not have concrete topping and where required by appropriate UL Design. Bonding adhesive is optional in other conditions unless recommended by manufacturer of sprayed fire protection material (SFRM). Apply bonding adhesives in accordance with manufacturer's written application instructions.
- H. Do not install fireproofing prior to completion of concrete work on steel pan stairs. Apply to underside of roof deck assemblies only after roofing system is complete and roof traffic has ceased.
- I. Cracking: No cracking of fireproofing material allowed per UL requirements. Repair cracks at no additional cost to Owner by removing existing fireproofing and reapplying

3.4 PATCHING, REPAIRING, CLEANING AND PROTECTION

- A. Perform patching and repairing of sprayed fireproofing, due to cutting by other trades, by fireproofing applicator. Work shall be paid for by trades that performed cutting, as directed and at no additional cost.
 - 1. Coordinate installation of fireproofing with other work in order to minimize need for other trades to cut or remove fireproofing. As other trades successively complete installations of their work, maintain protection of structure's fireproofing by patching areas which have been removed or damaged prior to concealment of fireproofing by other work.
- B. After completion of fireproofing work, remove equipment and clean walls, floors, equipment, pipes and conduit of over sprayed fireproofing materials.
- C. Cleaning: Immediately upon completion of sprayed operations in each containable area, remove over-spray and fall-out materials from surfaces of other work and clean exposed surfaces to remove evidence of soiling.
- D. Cure exposed wet-mix fireproofing materials in compliance with fireproofing manufacturer's recommendations to prevent premature drying.
- E. Protect fireproofing according to advice of fireproofing manufacturer and installer from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of Substantial Completion.

3.5 FIELD QUALITY CONTROL

- A. At Owner's option Architect may select, and Owner will pay, independent testing laboratory to sample and verify thickness and density of fireproofing in accordance with provisions of ASTM E605, and cohesion/adhesion as per ASTM E736.
 - 1. Minimum testing as follows:
 - a. Randomly Selected Bay: Test each fireproofed element for thickness and density as per ASTM E605 and displacement method per AWCI Tech Manual 12-A, 5.4.5.
 - b. Randomly Selected Typical Structural Elements: Test for cohesion/adhesion as per E736.
 - c. Perform minimum of 5 tests of each kind.

- B. Contractor and sub-contractor for this Section shall cooperate with testing agency in furnishing samples for testing, and other testing agency procedures.
 - 1. Should tested fireproofing fail to meet performance criteria, remove fireproofing, reinstall and retest at no additional cost to Owner.
 - 2. Correct unacceptable work and pay for further testing required to prove acceptability of installation.
 - 3. Patch test areas as required to re-establish fireproofing integrity.

3.6 INSTALLED WORK

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

SECTION 07 84 00 FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Firestop joint sealant and backing, including intumescent elastomeric compounds and sealants.
 - 2. Rigid boards, forms, wraps and accessories.
 - 3. Fiber packing and fiber fill.
 - 4. Wool fiber insulation and fire-safing insulation.
 - 5. Other firestopping as indicated.

1.2 ACTION SUBMITTALS

- A. Product Data: Manufacturer's specifications and technical data for each material including the following.
 - 1. Composition and limitations.
 - 2. Manufacturer's installation instructions.
 - 3. Furnish sleeve size schedule indicating size of penetrating item, insulation thickness (where applicable), and minimum annular space requirements.
- B. Proposed UL System Drawings - Special Installation Drawings: Prior to starting installation of firestopping, firestopping manufacturer and installer shall review specific conditions applicable for Project, and identify each condition for firestopping and prepare individual U.L. Designs or manufacturers engineering judgements identification numbers, and installation drawings for each condition.
 - 1. Submit 3 Special Installation Drawings for each condition, 1 set for Owner, 1 set for Architect's File Copy, and 1 set for Building Official.
 - 2. Submit other information as may be requested by Building Official.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.
- C. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, plus the following.
 - 1. Acceptable to or licensed by manufacturer, State or local authority where applicable.
 - 2. Not less than 2 years' experience with systems.
 - 3. Successfully completed not less than 5 comparable scale projects using this system.
- B. Field Samples: First two applications for each firestopping condition will be reviewed by Owner's Representative and the Architect, and when accepted by the local Building Official shall become a standard of performance for remaining Work.
 - 1. Correct areas, modify method of application/installation, or adjust as directed by local code official to comply with specified requirements.
 - 2. Maintain field samples accessible to serve as a standard of quality for this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle to prevent damage, staining and disfigurement in original, new, and unopened packages and containers bearing manufacturer's name and label identifying contents. Do not freeze.
- B. Where limited shelf life of product is noted by date on container or packing list, take note and do not use out of date material.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Store firestopping materials out of weather, in cool, dry place, out of direct sunlight, at temperatures below 90 degrees F, not less than 40 degrees F and as recommended by manufacturer.
- B. Use of Foam Products: Store unmixed liquid components in original, unopened containers at temperature of 65 to 80 degrees F for 12 hours minimum before use. Use forced air ventilation in areas having less than 2 cubic feet of free air for each pound of liquid mixture being foamed.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements: Comply with fireproofing material manufacturer's recommendations for temperature and humidity conditions before, during, and after installation of fireproofing.
- B. Ventilation Requirements: Comply with fireproofing material manufacturer's recommendations during and after installation of fireproofing by natural or mechanical means.
- C. Sleeves: Unless otherwise called for, sleeves passing through walls, slabs, beams, bridging, columns, shall be minimum of 1/2 inch greater in inside diameter than external diameter of pipe passing through sleeves, or insulation diameter. Verify sleeve size required with manufacturer of firestopping used. Pipe insulation shall be continuous through sleeves. Space between sleeve and pipe or duct and annular opening space shall be provided with a firestop system. Notify Contractor immediately of deviation from above sleeving requirements.
- D. Fire Dampers: Firestopping of annular spaces around fire dampers shall be placed before installation of damper's anchoring flanges.

1.8 SEQUENCING

- A. Sequence and coordinate application of firestopping with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosures to prevent deterioration of firestopping for interior applications due to exposure to unfavorable environmental conditions.
 - 2. Do not install enclosing or concealing construction until after firestopping has been applied, inspected, tested, and corrections have been made to any defective firestopping.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Single Source Responsibility for Materials: Obtain firestopping materials from one manufacturer for entire project.
 - 1. This does not restrict Contractor from subcontracting installation of firestopping to multiple subcontracts, but does require all installers do use the same manufacturer throughout the Project and be licensed by that manufacturer for the installation of firestopping.
- B. Acceptable manufacturers and products (FSTOP): Products listed in UL Fire Resistance Directory for UL System involved, that are manufactured by one of the following:
 - 1. 3M Fire Protection Products.
 - 2. Hilti Construction Chemicals, Inc.
 - 3. Grace Construction Products
 - 4. Nelson Firestop Products
 - 5. Rectorseal Company
 - 6. Specified Technologies Inc.

7. Tremco
8. US Gypsum Company

2.2 THROUGH-PENETRATION FIRESTOPPING OF FIRE RATED CONSTRUCTION

- A. Fire-Test Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those of this specification Section:
 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, ITS, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in "Fire Resistance Directory."
 - 2) ITS in "Directory of Listed Products."
- B. Fire Rated Construction Design Requirements: Maintain barrier fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.
- C. Through-Penetration Fire Stopping Schedule: Assembly designs are specified generally under UL system categories by penetrating item. Manufacturers' product applications must have specific UL system designations. The schedules on the following page indicate which Series of UL Classified Through Penetration Fire Stopping (TPFS) assemblies are acceptable for this Project based on barrier type, construction and penetrant type. The TPFS Series listed are generic in nature; ex: Series C-AJ-2000 includes all designs from 2001 through 2999 from all manufacturers; note that each manufacturer has its own number for tested assemblies. The Contractor will select appropriate TPFS assemblies for each condition encountered.
- D. Refer to Schedule at the end of this section.
- E. Design of firestopping described by this Section is responsibility of Contractor. Individual through-penetration systems, construction-gap firestopping, through-penetration smoke-stopping, and construction-gap smoke-stopping will be selected by Contractor to meet requirements of Contract Documents and governing codes. Actual selection of individual designs or systems is responsibility of Contractor, and 'Single Source Responsibility for Materials' is required.
- F. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that they conform to the construction type, penetrant type, annular space requirements, and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.
 1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the product, or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.

2.3 FIRESTOPPING, GENERAL

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

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

2.4 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. At Noise Critical Spaces: Provide permanently non-hardening systems at penetrations through fire-rated partitions and slabs, and at head of fire-rated partitions.
 1. Gun or Trowel-Applied Intumescent Sealant: 3M "CPW-25WB+" or approved equal.
 2. Moldable Intumescent Putty: 3M "Moldable Fire Stop" or approved equal.
 3. Non-Intumescent Silicone Sealant: 3M "Silicone Fire Stop", USG "SmokeSeal" or approved equal) may be used in lieu of the sealant on foam rod in noise-sensitive fire-rated walls.
- C. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- D. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- E. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- F. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- G. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- H. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- I. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- J. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- K. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- L. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 2. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.
- M. Wiring devices: Ez-Path Fire Rated Pathway by Specified Technologies, Inc.
 1. Fire-rated wiring devices containing intumescent material that allows cable to pass through device and adjusts automatically to cable additions or removals.
 2. F Rating: Equal to rating of barrier in which device is installed.

3. Capable of allowing a 0 to 100-percent visual fill of cables.
4. Sufficient size to accommodate quantity and size of electrical wires and data cables required.
5. Provide with steel wall plates allowing for single or multiple devices to be ganged together.

2.5 MIXING

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

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
 4. Do not allow caulks containing solvents to come in direct contact with plastic pipe.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

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

3.4 INSTALLATION

- A. Use methods and materials indicated in firestopping systems shown in Referenced Standards.

- B. Install penetration seal materials in accordance with instructions in UL Building Materials Directory and in accordance with manufacturer's printed instructions.
- C. Install sealant, including forming, packing and other accessory materials to fill opening around services penetrating floors and walls to provide firestops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs.
 - 1. Use masking tape to protect finished substrates and products adjacent to sealant materials.
 - 2. Apply sealant as specified under Section 079200 - Joint Protection, and as recommended by sealant manufacturer; apply bead to depth of 1-1/2 inches to fill void above support, or if mineral wool support is used to depth of 1/2 inch thick. Tool sealant immediately after application and before skin forms.
 - 3. If using foam sealant, immediately after mixing, pour or inject liquid foam into penetration opening, not more than 1/3 full to compensate for expansion during cure or in strict accordance with sealant manufacturer's recommendations. Do not exceed measured snap time of foam sealant. Do not remove dams for 24 hours minimum to allow foam to fully cure.
- D. At sleeved pipes or other sleeved penetration, firestop annular space between sleeve and its contained pipe or duct with resilient firestopping sealant system to permit movement of pipe or duct without damage to firestopping sealant.
- E. Seal holes and voids made by penetrations to ensure effective fire and smoke barrier.
- F. Patch penetrations caused by cutting or presence of unused or abandoned openings or boxes using materials compatible with barrier construction and with fire rating equal to or greater than barrier rating.
- G. For plumbing sleeves, construct time rated walls after placement of penetrating materials if possible, and to fit rated construction materials tightly to or directly upon material of penetration.
- H. Large Openings: Close unused portions of large openings (annular spaces) made for later installation of pipes and ducts with solid fill equal to barrier rating or with applicable firestopping sealant system.
 - 1. Where both horizontal dimensions exceed 4 inches in structural floor openings, firestop annular spaces with concrete, or other rated assembly. Provide dowels and reinforcement, within such fill, equal to that specified for slab.
 - 2. In rated concrete or masonry wall openings where both height and width exceed thickness of rated materials, firestop annular spaces with masonry or other solid fill.
 - 3. Use fiber fill, solid fill or fiber packing to make up remainder of barrier thickness where required width of firestopping sealant system is less than barrier.
- I. Install firestopping materials capable of supporting same loading as floor at floor openings more than four inches in width without penetrating item and subject to traffic or loading.
- J. Install firestopping at least equal to barrier fire rating in and around penetrations of floor structures, exterior walls and interior walls noted as time rated fire barriers or smoke barriers.
- K. Unused or abandoned openings or boxes or penetrations caused by cutting shall be patched with materials compatible with barrier construction and with fire rating equal to or greater than barrier fire-rating.
- L. Use firestopping sealant systems at narrow spaces and at spaces with dimensions less than barrier thickness.
- M. Fill void spaces completely with firestopping material.
- N. Protect materials from damage on surfaces subject to traffic. Provide firestopping in floors flush with top of slab, sleeve or housekeeping pad.

3.5 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

**Warning – Fire-stop System
DO NOT DISTURB
Notify Building Management of Any Damage**

Manufacturer's System No. _____
UL System No: _____
Contractor: _____
Date Installed: _____
Manufacturer: _____

3.6 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.
 1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.
- B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.
- C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- D. Manufacturer's Field Services: Firestopping manufacturer's technical representative shall provide the following field services during application.
 1. Perform a pre-installation examination and acceptance of substrate and voids scheduled for firestopping. Issue report.
 2. Be present at initial start-up for each process. Confirm application techniques. Issue report.
 3. Issue a summary report at completion of installation indicating manufacturer's acceptance of installed system and compliance with UL Design requirements.

3.7 ADJUSTING AND CLEANING

- A. Clean up spills of liquid components.
- B. Neatly cut and trim materials.
- C. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.8 SCHEDULE

THROUGH-PENETRATION UL CLASSIFICATION SYSTEM

Fire Stopping Systems

UL Classification System

		Construction Penetrated	Type Of Construction	System Identification
1	No Penetrating Items:	F, W, C	A, B, J, K, L	0001-0999
2	Metallic Pipes, Conduit or Tubing:	F, W, C	A, B, J, K, L	1001-1999
3	Nonmetallic Pipe, Conduit or Tubing:	F, W, C	A, B, J, K, L	2001-2999
4	Electric Cables:	F, W, C	A, B, J, K, L	3001-3999
5	Cable, Trays with Electric Cables:	F, W, C	A, B, J, K, L	4001-4999
6	Insulated Pipes:	F, W, C	A, B, J, K, L	5001-5999
7	Electrical Bussduct Penetrations:	F, W, C	A, B, J, K, L	6001-6999
8	Mechanical Ductwork Penetrations:	F, W, C	A, B, J, K, L	7001-7999

Construction Penetration

F Floor penetration
W Wall penetration
C Either Wall or Floor Penetration

Type of Construction

A- Concrete floors equal to or less than 5-inches thick
B- Concrete floors greater than 5-inches thick
J- Concrete or masonry walls equal to or less than 8-inches thick
K- Concrete or masonry walls greater than 8-inches thick
L- Framed walls

JOINT UL CLASSIFICATION SYSTEM

Fire-Resistant Joint Systems			UL Classification System	
		Joint System	Movement Capability	Joint Width range
1	Floor-to-Floor	FF	S/D	0000-4999
2	Wall-to-Wall	WW	S/D	0000-4999
3	Floor-to-Wall:	FW	S/D	0000-4999
4	Head-to-Wall: Wall-to-Wall as Corner	HW	S/D	0000-4999
5	Guards	CG	S/D	0000-4999
6	Bottom of Wall	BW	S/D	0000-4999

Movement Capability

S- No movement (Static)
D- Allows movement (Dynamic)

Joint Width

0000-0999 Less than or equal to 2 inches
1000-1999 Greater than 2 inches and less than or equal to 6 inches
2000-2999 Greater than 6 inches and less than or equal to 12 inches
3000-3999 Greater than 12 inches and less than or equal to 24 inches
4000-4999 Greater than 24 inches

END OF SECTION

SECTION 07 84 43

FIRE-RESISTANT JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fire-resistant joint systems for the following:
 - 1. Head-of-wall joints.
 - 2. Joints at cold formed exterior wall framing and floor slab.
 - 3. Joints between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated, exterior, glazed aluminum curtain walls.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistant joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistant joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistant joint system configuration for construction and penetrating items.
- C. Product Certificates: For each type of fire-resistant joint system, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. Compatibility and Adhesion Test Reports: From fire-resistant joint system manufacturer indicating the following:
 - 1. Materials forming joint substrates have been tested for compatibility and adhesion with fill materials.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Research/Evaluation Reports: For each type of fire-resistant joint system.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire-resistant joint systems for each kind of joint and construction condition indicated through one source from a single manufacturer.
- B. Preconstruction Compatibility and Adhesion Testing: Submit to fire-resistant joint system manufacturers, for testing indicated below, samples of materials that will contact or affect fill materials.
 - 1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of fill materials to joint substrates.
 - a. Perform tests under environmental conditions replicating those that will exist during installation.
 - 2. Submit no fewer than nine pieces of each type of material, including joint substrates, forming materials, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain fire-resistant joint system manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 PROJECT CONDITIONS

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

1.6 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistant joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistant joint systems.
- C. Do not cover up fire-resistant joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: For joints in the following constructions, provide fire-resistant joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistant joint systems are installed:
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
 - 3. Exterior curtain-wall assemblies and fire-resistance-rated floor assemblies.
 - 4. Exterior stud wall assemblies and fire-resistance-rated floor assemblies.
- B. Fire Resistance of Joint Systems: Assembly ratings (and movement capabilities) indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.
- C. Fire Resistance of Perimeter Fire-Containment Systems: Integrity and insulation ratings indicated as determined by UL 2079.
- D. Fire-Test-Response Characteristics: Provide fire-resistant joint systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 - 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistant joint systems acceptable to authorities having jurisdiction.
 - 2. Fire-resistant joint systems are identical to those tested per ICBO ES AC30 and are qualified for types of joints and joint movement capabilities indicated in a current Evaluation Report by the ICBO Evaluation Service.

3. (Fire-resistant joint systems are identical to those tested per UL 2079 [and ICBO ES AC30 and are qualified for joint movement capabilities indicated in a current ICBO Evaluation Report by the ICBO Evaluation Service]. Perimeter fire-containment systems are identical to those tested per UL 2079.] Provide rated systems complying with the following requirements:
 - a. Fire-resistant joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistant joint systems correspond to those indicated by referencing system designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."

2.2 PRODUCTS AND MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 1. Basis-of-Design Products: The design for each fire-resistant joint system is based on products named in Part 2 articles. Subject to compliance with requirements, provide either the named products or comparable products by one of the following:
 - a. Fire-resistant joint systems:
 - 1) 3M Fire Protection Products Systems, Inc.
 - 2) Specified Technologies, Inc.
 - 3) A/D Fire Protection Systems Inc.
 - 4) Hilti, Inc.
 - 5) RectorSeal Corporation (The)
 - 6) United States Gypsum Company.
 - b. Perimeter Fire-Containment Systems:
 - 1) Specified Technologies Inc.
 - 2) United States Gypsum Company.
- B. Compatibility: Provide fire-resistant joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistant joint system manufacturer based on testing and field experience.
- C. Accessories: Provide components of fire-resistant joint systems, including forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistant joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.3 FIRE-RESISTANT JOINT SYSTEMS

- A. Where UL-classified fire-resistant joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.
- B. (FRJS-1) Head-of-Wall, Fire-resistant joint system at interior partitions:
 1. Basis-of-Design UL-Classified Product: UL HW-D joint type or similar systems from Intertek to be selected based on actual conditions and subject to approval through submittals. Provide engineering judgment acceptable to Architect and authority having jurisdiction for head of wall conditions where a tested system is not available for the actual conditions.
 2. Assembly Rating: 1 hour or 2 hour to be consistent with wall ratings shown on Drawings.
 3. Nominal Joint Width: As shown.
 4. Movement Capabilities: Class II, 18.75 percent movement in compression and extension.

2.4 PERIMETER FIRE-CONTAINMENT SYSTEMS

- A. Where UL-classified perimeter fire-containment systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHDG.
- B. (FRJS-2) Perimeter Fire-Containment System at Curtain Walls
 1. Basis-of-Design System: Provide CW-D type listed by UL or CEJ type listed by Intertek for joint conditions. Provide engineering judgment acceptable to Architect and authority having jurisdiction if a tested, listed system is not available.

2. Assembly Rating: 1 hour or 2 hour to be consistent with assembly ratings shown on Drawings.
 3. Joint Width: As shown.
 4. Movement Capability: Joint system capable of withstanding total horizontal movement of 25 percent compression and elongation and a total vertical shear movement of 12.5 percent.
- C. (FRJS-3) Perimeter Fire-Containment System at Exterior Stud Walls
1. Basis-of-Design System: Provide CW-S type listed by UL or CEJ type listed by Intertek for joint conditions. Provide engineering judgment acceptable to Architect and authority having jurisdiction if a tested, listed system is not available.
 2. Assembly Rating: 1 hour or 2 hour to be consistent with assembly ratings shown on Drawings.
 3. Joint Width: As shown.
 4. Movement Capability: Joint system capable of withstanding total horizontal movement of 25 percent compression and elongation and a total vertical shear movement of 12.5 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistant joint systems to comply with fire-resistant joint system manufacturer's written instructions and the following requirements:
 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistant joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistant joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistant joint system materials.
 1. Remove tape as soon as possible without disturbing fire-resistant joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistant joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistant joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistant joint systems by proven techniques to produce the following results:
 1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistant joint systems and to prepare inspection reports.
 - 1. Inspecting agency will state in each report whether inspected fire-resistant joint systems comply with or deviate from requirements.
- B. Proceed with enclosing fire-resistant joint systems with other construction only after inspection reports are issued and inspecting agency has approved installed fire-resistant joint systems.
- C. If deficiencies are found, repair or replace fire-resistant joint systems so they comply with requirements.

3.5 CLEANING AND PROTECTION

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

END OF SECTION

SECTION 07 92 00 JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior and interior sealants (SLNT).

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
 - 1. Submit Manufacturer's certifications that products comply with specified requirements and with local regulations for VOC content.
- B. Color Samples:
 - 1. Samples for Initial Selection: Manufacturer's color charts consisting of actual strips of cured sealants showing the full range of colors available for each product exposed to view.
 - 2. Samples for Verification: For each kind and color of joint sealant selected, 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. Product Schedule: Cross-reference products using "SLNT" designation in Part 2 of this Section, with Sealant Schedule in Part 3 of this Section, to locations and applications. Indicate proposed product, product type and color.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Sample Warranties: For special warranties.
- C. Quality Control Submittals:
 - 1. Product Test Reports: For each kind of joint sealant.
 - 2. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 3. Statement of qualification for manufacturers and installers.
 - 4. Statement of compliance for compatibility of sealant with adjacent materials and coatings.
 - 5. Field-Adhesion-Test Reports: For each sealant application tested.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with record of successful in-service performance.
- B. Provide materials for exterior envelope from a single manufacturer.
- C. Compatibility: Verify compatibility of silicone sealant with materials in contact with sealant. Provide list of stone materials and verify that silicone sealant will not stain or damage stone work.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi component materials.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Weather Conditions: Do not proceed with installation of sealant under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
 - 1. Proceed with work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.
 - 2. Wherever joint width is affected by ambient temperature variation, apply elastomeric sealant only when temperatures are in lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.
- D. Compatibility and Adhesion Testing: Ascertain sealant compatibility and adhesion with adjacent materials using laboratory testing procedures.

PART 2 PRODUCTS

2.1 SEALANT, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Sealant Colors: In accordance with approved sealant color schedule.
 - 1. Colors as selected by Architect from manufacturer's standard colors. Acceptance of sealant will depend on range of standard colors available for selection.
 - 2. Custom Color:
- C. Interior Sealants: Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.

2.2 POLYURETHANE SEALANT

- A. (SLNT-1) 1-Part Polyurethane Sealants: Polyurethane based one part elastomeric sealant, complying with FS- TT-S-00230C, Type II Class A, with elongation and compression of not less than 25 percent. ASTM C920, Type S, Class 25, Grade NS.
 - 1. Manufacturers and Products:
 - a. Sika Chemical Corporation: Sikaflex-1a.
 - b. BASF Building Systems: Sonolastic NP-1.
 - c. Tremco Incorporated: Dymonic.
 - d. Pecora Corporation: Dynatrol I.
 - e. Tremco Incorporated: Vulkem 116.
- B. (SLNT-2) 2-Part Polyurethane Sealant for Horizontal Applications: Self-leveling polyurethane based 2 part elastomeric sealant, complying with FS-TT-S-00227E, Type I, Class A, with shore A hardness of not less than 30 and elongation and compression of not less than 25 percent. ASTM C920, Type M, Class 25, Grade P.
 - 1. Manufacturers and Products:

- a. Tremco Incorporated: THC900.
 - b. BASF Building Systems: Sonolastic SL-2.
 - c. Pecora Corporation: Urexpan NR-200.
- 2. Location/Use:
 - a. Joints in horizontal surfaces subject to traffic.
 - b. Isolation joints in cast-in-place concrete slabs.
 - c. Other joints as indicated.
- C. (SLNT-9) Single-Component, Nonsag, Urethane Adhesive and Sealant: ASTM C 920, Type S, Grade NS, Class 35, Use NT, M, A, T, O and I, FS TT-S-00230C, Type II, Class A.
 - 1. Manufacturers and Products:
 - a. MasterSeal NP-1, by Master Builders solution, BASF Corporation
 - 2. Application: For use **under sheet metal flashing** to bond and seal to substrate.

2.3 SILICONE SEALANT

- A. (SLNT-3) Low-Modulus Silicone Rubber Sealant: Silicone rubber based, one part neutral cure elastomeric sealant with plus 50 percent to minus 50 percent movement complying with FS-TT-S-001543, Class A, and recommended by manufacturer for joints.
 - 1. Manufacturers and Products:
 - a. General Electric: Silpruf SCS 2000.
 - b. Dow Corning Corporation: 795 Building Sealant.
 - c. BASF Building Systems: Sonolastic Omniseal or OmniPlus.
 - d. Pecora Corporation: 864 Silicone.
 - e. Tremco Construction Division: Spectrem 3.
- B. (SLNT-4) Medium-Modulus Silicone Rubber Sealant: Silicone rubber based, specifically designed for weatherproofing stone or other porous materials, two part moisture cure elastomeric sealant with plus 50 percent to minus 50 percent movement and recommended by manufacturer for stone joints.
 - 1. Manufacturers and Products:
 - a. General Electric: Silpruf SCS 2000.
 - b. Dow Corning Corporation: 756 Building Sealant.
 - c. Tremco Construction Division: Spectrem 2.
- C. (SLNT-5) Ultra-Low-Modulus Silicone Rubber Sealant: Silicone rubber based, one part neutral cure elastomeric sealant with plus 100 percent to minus 50 percent movement complying with FS-TT-S-001543, Class A.
 - 1. Manufacturers and Products:
 - a. Dow Corning Corporation: 790 Building Sealant.
 - b. Tremco Construction Division: Spectrem 1.
- D. (SLNT-6) Silyl-Terminated Polyurethane Joint Sealant (STPU): ASTM C920, Type S, Grade NS, Class 12.5, for Us NT.
 - 1. Product and Manufacturer:
 - a. Dymonic FC, by Tremco Incorporated:
 - b. Dyanflex SC, by Pecora Corporation
 - 2. Application: **Adhering joint dowel pins at stonework.**
- E. (SLNT-8) Silicone Sealant, Mildew-Resistant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
 - 1. Products and Manufacturers:
 - a. Dow Corning Corporation; Dow Corning 786.
 - b. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
 - c. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
 - d. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.

- e. Tremco Incorporated; Tremsil 600 White.
- 2. Location/Use:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Joints subject to water and high moisture areas.
 - d. Other joints as indicated.
- F. (SLNT-9) Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT; field-tintable; non-staining.
 - 1. Field-Tinted: Provide at locations as directed by Architect.
 - a. Basis of Design: Pecora Corporation; 890FTS.
 - b. Color: As selected by Architect to match <INSERT>.
 - 2. Field-Tinted and Textured: Provide at locations as directed by Architect.
 - a. Basis of Design: Pecora Corporation; 890FTS-TXTR.
 - b. Color: As selected by Architect to match <INSERT>.

2.4 BUTYL SEALANT

- A. (SLNT-10) Concealed Sealant; Butyl Sealant: Non-skinning, non-drying, flexible synthetic butyl sealant.
 - 1. Manufacturers and Products:
 - a. Tremco Construction Division; TremPro JS-773.
 - b. Pecora Corporation; BA-98.
 - 2. Location/Use: concealment locations, such as flashing backpane joints, coping joints, roof edge joints, setting aluminum storefront windows, window sills, etc. and where called for in other assemblies.

2.5 ACRYLIC SEALANT

- A. (SLNT-7) Acrylic Sealants: General purpose, paintable acrylic-emulsion sealant. Caulk with approximately 12-1/2 percent elongation complying with ASTM C834.
 - 1. Products and Manufacturers:
 - a. Tremco Incorporated: Acrylic Latex 834.
 - b. BASF Building Systems: Sonolac.
 - c. Pecora Corporation: AC-20.
 - 2. Location/Use:
 - a. Joints in vertical surfaces and in horizontal surfaces not subject to traffic.
 - b. Control and expansion joints on exposed interior surfaces of exterior walls.
 - c. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls, and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - e. Joints between plant-precast structural concrete units.
 - f. Other joints as indicated.

2.6 JOINT SEALANT BACKING

- A. Joint Sealant Backer Rod Manufacturers:
 - 1. Denver Foam, Backer Rod Manufacturing, Inc.
 - 2. Sonneborn Sonolastic, BASF Building Systems.
 - 3. Construction Foam Products, Nomaco Inc..
- B. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- C. Sealant Backing Material: Nonstaining, sealants, primers, and other joint fillers; compatible with joint substrates; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- D. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- E. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 PREPARATORY MATERIALS

- A. Joint Primer: Non-staining type recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive type recommended by sealant manufacturer; compatible with joint forming materials.
- C. 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.
- D. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine joint surfaces, backing, and anchorage of units forming sealant rabbet, and conditions under which sealant work is to be performed. Do not proceed with sealant work until unsatisfactory conditions have been corrected.

3.2 JOINT SURFACE PREPARATION

- A. Preparation: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 1. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
 - 2. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- B. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant.
- C. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant application.
- D. Roughen joint surfaces on vitreous coated and similar non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or steel wool to produce dull sheen.
- E. Ensure that joint forming materials are compatible with sealant.
- F. Examine joint dimensions and size materials to achieve required width/depth ratios. Use joint filler to achieve required joint depths, to allow sealants to perform properly.

3.3 SEALANT APPLICATION

- A. Installation:
 - 1. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
 - 2. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
 - 3. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 4. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 5. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
- B. Apply sealant in accordance with manufacturer's printed instructions. Perform work in accordance with ASTM C804.
- C. Prime or seal joint surfaces. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
- D. Install sealant backer rod for liquid elastomeric sealant, except where recommended to be omitted by sealant manufacturer for application shown.
- E. Install bond breaker tape wherever required by manufacturer's recommendations to ensure that elastomeric sealant will perform properly.
- F. Employ only proven installation techniques, which will ensure that sealant will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides.
 - 1. Except as otherwise indicated, fill sealant rabbet to slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between horizontal surface and vertical surface, fill joint to form slight cove, so that joint will not trap moisture and dirt.
- G. Install sealant to depth as shown or, if not shown, as recommended by sealant manufacturer but within following general limitations, measured at center (thin) section of bead:
 - 1. For sidewalks, pavements and similar joints sealed with elastomeric sealant and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8 inch deep nor less than 3/8 inch deep.
 - 2. For normal moving joints sealed with elastomeric sealant, but not subject to traffic, fill joint to depth equal to 50 percent of joint width, but not more than 1/2 inch deep nor less than 1/4 inch deep.
- H. Interior joints not subject to movement, these are:
 - 1. Gypsum board to masonry joints.
 - 2. Gypsum board to hollow metal joints.
 - 3. Gypsum board to concrete joints.
- I. Do not allow sealant or compounds to overflow or flow onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough texture surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either primer/sealer or sealant.
- J. Remove excess and spillage of sealant promptly as work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes.
- K. Rope Wicks: Where wicks for weeping masonry cavity occur in sealant, cut wick flush with sealant face and do not seal wick ends.

3.4 **SILICONE SHEET SEAL APPLICATION**

- A. Bond silicone seal to clean, dry, frost-free, dust-free substrates using specified silicone building sealant. Field adhesion testing should be done to determine if primer is required for proper adhesion of silicone building sealant to the substrate.1
- B. Preparation Work
 - 1. Clean porous surfaces with abrasion cleaning followed by blasts of oil-free compressed air. If high-pressure water cleaning is necessary, use caution to prevent water from entering the structure through the existing failed joint. Exterior surfaces must be visibly dry before installing silicone seal.
 - 2. Clean nonporous surfaces using the two-cloth solvent wipe as outlined in application guidelines.
- C. Masking: Apply masking tape in areas of high visibility to ensure good aesthetics.
- D. Apply a bead of silicone building sealant to each side of the joint
- E. Within 10 minutes of sealant application, press the extrusion into the sealant to wet the extrusion, substrate and sealant. Use roller to apply consistent pressure to ensure uniform contact.
- F. Complete horizontal joints before application of vertical joints. Lap vertical joints over horizontal joints.

3.5 **FIELD QUALITY CONTROL**

- A. Sealant Adhesion Field Test: Comply with following.
 - 1. Weathering Sealant Adhesion: After liquid-applied sealant is fully cured, perform sealant adhesion test according to sealant manufacturer's recommendations.

3.6 **PROTECTION AND CLEANING**

- A. Protect joint sealers during and after curing period from contact with contaminating operations or other causes so that they are without deterioration or damage at time of Substantial Completion.
 - 1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealant or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.7 **JOINT-SEALANT SCHEDULE**

- A. General: Provide sealant where indicated (SLNT) or as required to achieve a weather-tight assembly.
 - 1. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.
 - 2. The following schedule is not intended to be all-inclusive and some may not be applicable to this Project.
- B. Exterior Joints:
 - 1. Horizontal Surfaces Subject to Traffic:
 - a. Joint Locations:
 - 1) Isolation and contraction joints in cast-in-place concrete slabs.
 - 2) Joints between plant-precast architectural concrete paving units.
 - 3) Joints in stone paving units, including steps (where applicable).
 - 4) Tile control and expansion joints.
 - 5) Joints between different materials listed above.
 - 6) Other joints as indicated.
 - b. (SLNT-2): 2-Part polyurethane sealant, self-leveling, traffic grade, Class 25 .
 - 2. Horizontal Surfaces Subject to Traffic and Water Immersion:
 - a. (SLNT-_) : Polyurethane sealant, submersible, multi-component, self-leveling traffic grade.

3. Vertical Surfaces and Horizontal Surfaces Not Subject to Traffic:
 - a. Joint Locations:
 - 1) Construction joints in cast-in-place concrete.
 - 2) Control and expansion joints in unit masonry.
 - 3) Joints between metal panels.
 - 4) Joints between different materials listed above.
 - b. (SLNT-3): Silicone single component, nonsag, neutral curing, Class 25
 - c. (SLNT-4): Silicone multicomponent, nonsag, neutral curing.
 4. Perimeter joints between materials listed above and frames of doors, windows, and louvers:
 - a. (SLNT-4): Silicone multicomponent, nonsag, neutral curing.
 5. Vertical Surfaces and Horizontal Surfaces Not Subject to Traffic:
 - a. Joint Locations:
 - 1) Unit Masonry Glazed Aluminum Framing System.
 - 2) Metal Panel to Glazed Aluminum Framing System.
 - b. (SLNT-5) Silicone Ultra Low-Modulus Silicone Rubber Sealant.
 6. Vertical Surfaces and Horizontal Surfaces Not Subject to Traffic:
 - a. Joint Locations:
 - 1) Stone to Stone
 - 2) Stone to Masonry
 - 3) Cast Stone to Cast Stone
 - 4) Stone to Cast Stone
 - b. (SLNT-9): Silicone Single-Component, Nonsag, Neutral-Curing.
- C. Interior Joints:
1. Horizontal Surfaces Subject to Traffic:
 - a. Joint Locations:
 - 1) Isolation joints in cast-in-place concrete slabs.
 - 2) Other joints as indicated.
 - b. (SLNT-2): 2-Part polyurethane sealant, self-leveling, traffic grade, Class 25 .
 2. Vertical Surfaces and Horizontal Surfaces Not Subject to Traffic: Acrylic-based.
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls, and partitions.
 - 1) (CMU) to (CMU): Low modulus silicone sealant.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - f. Joints between plant-precast structural concrete units.
 - g. Other joints as indicated.
 3. Mildew-Resistant Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated.
 4. Acoustic Joint Sealant: Acoustical. Refer to Section 09 29 00 for acoustic sealant in gypsum board assemblies.

END OF SECTION

SECTION 09 22 00 NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-structural metal framing systems for interior assemblies, including:
 - a. Interior partitions.
 - b. Interior suspended ceiling and soffit systems.
 - c. Shaft wall systems.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Submit statement indicating that metal stud manufacturer has reviewed Project documents and that framing supplied conforms to specified requirements.
 - 2. Evaluation Reports: ICC-ES reports for metal studs and tracks, indicating compliance with specified requirements and building code in effect.

1.3 INFORMATIONAL SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 013300, indicating light gauge framing system. Indicate by plan and elevation, stud framing (spacing, sizes, thicknesses and types), openings, bracing and blocking, fastening and anchorage, strapping, bridging, connection details and reinforcement.
- B. Calculations: Structural design for metal studs supporting ACOUST-A and ACOUST-B ceiling types shall be performed by a Professional Engineer, licensed in the State of Texas, indicating structural integrity of members, anchors, fasteners and connections to building structure, in accordance with specified criteria. Signed engineering calculations shall be submitted to Architect/Engineer upon request.
 - 1. Engineering Responsibility: Calculations shall be reviewed for stated design assumptions, general compliance to specified requirements, and forces imposed on structure. The accuracy of the design calculations shall be the sole responsibility of the Contractor's Professional Engineer.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with applicable reference standards unless otherwise indicated.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Texas and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent
- C. Pre-Installation Conference: Convene a pre-installation meeting at the beginning of the project to review acoustically-rated construction requirements and to coordinate penetrations.
 - 1. Architect, Contractor, Owner's representative and each trade that may need to penetrate acoustically rated construction or will be involved in construction of acoustically rated partitions and related systems must attend.
 - 2. Review layouts and routing for potential penetrating items, discuss reducing or eliminating penetrating items by considering alternate routing, review construction requirements, details and specifications for acoustically rated construction.
 - 3. A follow-up meeting should be scheduled as needed.
 - 4. This meeting can occur in conjunction with a regular construction progress meeting.
 - 5. Publish meeting minutes highlighting topics discussed, actions items and decision made.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Design framing systems in accordance with American Iron and Steel Institute *AISI Standard S220-11 North American Specification for the Design of Cold-Formed Steel Framing - NonStructural Members*, except as otherwise shown or specified.
- B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing metal framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- C. 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.
- D. Shaft Wall Assemblies: Provide stud shaft wall system designed and tested by manufacturer to withstand lateral loading (air pressure) of 10 lbs per sq ft for maximum wall height required, and with deflection limited to 1/240 of partition height. (Refer to Section 092900 - Gypsum Board for shaft wall construction).
- E. Studs and Joists Supporting Acoustic Wall and Ceiling Assemblies:
 - 1. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design joists and walls supporting ceiling type ACOUST-A and ACOUST-B.
 - 2. Structural Performance Requirements: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated. Provide in accordance with applicable codes and standards to safely support dead load of attached materials and a lateral unbalanced pressure of 5 pounds per square foot without excessive stress or deflection with following stipulation:
 - a. Metal Studs: Provide metal framings depths indicated in the drawings. Revise spacing and thickness of studs and joists as required to meet the stated load and deflection criteria.
 - 1) Stud Spacing: As required to meeting loading requirements but not over 16 inches on center.
 - 2) Stud Thickness: 33 mil minimum base metal thickness or as required to meet stated load and deflection requirements.
 - 3) Design joists supporting ceilings for a maximum deflection of 1/240th the joist span.
 - b. Bridging: Provide as required for walls that will be sheathed on only one side.
 - c. Lateral Bracing: Provide as required to limit deflection of wall and ceiling assemblies to 1/400th the height of the assembly.
 - d. Attachment to structure: Provide attachments to primary building structure without overload or distortion of metal studs, attachment elements, or building structure.
 - 3. Design light gage framing members in accordance with AISI "Specifications for Design of Cold-Formed Steel Structural Members"
- F. Acoustic Shelf Assembly in Concert Hall: Provide metal framing capable of withstanding design loads within limits and under conditions indicated. Design in accordance with applicable codes and standards to safely support point loads of 200 lbs, without excessive stress or deflection.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Provide framing type, weight, grade and finish of materials in accordance with Manufacturer's recommendations, except where otherwise required by governing regulations and applicable standards.
 - 2. Provide clips, fasteners, ties, reinforcing, flat strap and backing plates, stiffeners, shoes, tracks, hangers, brackets, anchors, accessories, and trim as recommended by Manufacturer for application indicated.
 - 3. Steel Sheet Components: ASTM C 645, fabricated of steel meeting requirements of ASTM A1003.

4. Protective Coating (Minimum): ASTM A653, G40 hot-dip galvanized zinc coating or coating with G40 equivalent corrosion resistance.
 5. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. (MET STUD-1) Metal Studs and Runners: ASTM C645, and meeting or exceeding flexural strength, allowable bending moment, and screw pull-out of a standard 33 mil thick stud.
 - C. (MET STUD-2) Shaft Wall Metal Studs: ASTM C645, steel C-H, C-T or I studs hot-dipped galvanized.
 - D. Double-Runners: ASTM C645 slip-type head joint; inside runner with 2-inch-deep flanges, and outer runner sized to friction fit inside runner.
 - E. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - F. Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - G. Furring and Bracing Members: Provide members with protective galvanized coating, in depths as indicated.
 1. (MET FURG-1) Hat-Shaped, Rigid Furring Channels: ASTM C645; with minimum base-metal thickness of 0.033 inch
 2. (MET FURG-2) Z-Shaped Furring: With slotted or nonslotted web; with minimum base-metal thickness of 0.027 inch.
 3. (MET FURG-3) Cold-Rolled Steel Channels: Channel bridging, furring channels, carrying channels, steel channel stiffeners and braces; with minimum base-metal thickness of 0.054 inch.
 4. (MET FURG-4) Resilient Furring Channels: Asymmetrical steel sheet members, with face attached to single flange by a slotted leg (web), designed to reduce sound transmission.
 - H. Galvanized Flat Strap and Backing Plate at Interior Stud Walls: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thicknesses:
 - a. Typical: 0.054 inch.
 - a. For Heavy Equipment and Grab Bar Locations: 0.068 inch.
 2. Where Wood Backing and Blocking is Indicated: Refer to Section 061000 for wood requirements. Provide fire-resistant treatment.

2.3 SUSPENSION SYSTEMS

- A. Components, General: Comply with ASTM C754 for conditions indicated.
- B. Furring Channels: As specified above.
- C. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.0625 inch diameter wire, or double strand of 0.0475 inch diameter wire.
- D. Hanger Attachment Anchors in Concrete: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488 by a qualified independent testing agency.
 1. Cast-in-place anchor, designed for attachment to concrete forms.
 2. Postinstalled, chemical anchor.
 3. Postinstalled, expansion anchor.
- E. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.162 inch diameter.
- F. Rod Hangers: ASTM A510, mild carbon steel; ASTM A153, hot-dip galvanized; 0.25 inch diameter.

- G. Manufactured Suspension Grid System for Ceilings and Soffits: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products and Manufacturers:
 - a. Drywall Grid Systems by Armstrong World Industries, Inc.;
 - b. Drywall Grid Systems by Chicago Metallic Corporation;
 - c. Drywall Suspension System by USG Corporation.

2.4 AUXILIARY MATERIALS

- A. Fasteners: Galvanized steel fasteners of type, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates; and of length suitable for adequate penetration of substrate
- B. Asphalt Protection Strips: Strip of 15 lb. asphalt saturated felt at intersection of partitions and masonry walls.
- C. Isolation Strip: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.
- D. Acoustic Sealant: In accordance with Section 09 29 00 - Gypsum Board.
- E. Sound and Vibration Control Components: See Section 134813 - Manufactured Sound & Vibration Control Components for resilient ceiling hangers, sway braces, wall isolators and similar sound and vibration control components (SVC) for acoustically-critical wall and ceiling assemblies.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standards: ASTM C 754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
 3. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
 4. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Install bracing at terminations in assemblies.
- C. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- D. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from plane formed by faces of adjacent framing.

3.4 FRAMING INSTALLATION

- A. Framing Installation, General:
1. Partition Heights: Extend partition stud system through suspended ceilings to structural support above, except where indicated to terminate at ceiling.
 - a. Provide additional bracing for partitions extending above ceiling where indicated.
 - b. Continue framing around ducts penetrating partitions above ceiling.
 2. Coordinate erection of studs with installation of service utilities. Align stud web openings. Coordinate installation of bucks, anchors, blocking, electrical and mechanical work which is to be placed in or behind partition framing. Allow such items to be installed after framing is complete.
 3. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned joints to attain lateral support and avoid axial loading.
 4. Reinforce stud partitions and provide additional metal studs as indicated and required for installation of wall cabinets, wall mounted equipment, wall mounted mechanical and electrical fixtures, accessories, shelves and shelf standards. Provide thick steel plate to span minimum of 3 studs for installation of mirrors, toilet accessories or grab bars.
 5. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 6. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- B. Runners and Tracks: Secure runner tracks to floor and ceiling construction, and to structure above ceilings as recommended by manufacturer, with fastener spacing not to exceed 24 inches o.c.
1. Runner Tracks: Provide continuous track sized to match studs. Align runner tracks accurately to partition layout at both floor and ceiling. Provide fasteners at corners and ends of runner tracks.
 2. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 3. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 4. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
- C. Metal Studs: Install studs vertically at 16 inches o.c., unless otherwise indicated, and not more than 2 inches from abutting construction, each side of openings, and at corners.
1. Install metal studs in floor and ceiling runner tracks. Secure studs to runners. Anchor light gauge screw-type partition studs to runner tracks by screwing opposite flanges top and bottom, except screw end studs to both tracks at both flanges.
 2. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
 3. Provide additional studs at exterior corners and 2 inches from inside corners, terminations of partitions, and both sides of control joints.

4. Where partitions abut other construction, provide vertical runner track securely attached to construction.
 5. Use full length studs between runner tracks.
 6. Stud Splicing: Not permitted.
- D. Door Openings:
1. Frame door openings with vertical studs attached to each jamb of door frame.
 2. Provide additional studs 2 inches from jamb studs.
 3. Frame head of door with horizontal section of runner track attached to jamb studs and provide vertical studs cut to fit between head and ceiling tracks and attach to tracks.
 4. Provide 3/4 inch cold-rolled steel channel stiffener at 6 inches above door head extending at least 2 stud spaces beyond jamb studs, and attach to studs.
 5. Fit runners under and above openings, secure intermediate studs at spacing of wall studs. Brace stud framing system and make rigid.
- E. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- F. Wall Furring Installation:
1. Erect wall furring directly attached to concrete block and concrete walls.
 2. Erect furring channels horizontally or vertically as indicated. Secure in place on alternate channel flanges at maximum 24 inches on center.
 3. Space furring channels maximum 24 inches on center, not more than 4 inches from floor and ceiling lines or abutting walls.
 4. Erect freestanding metal stud framing by means of adjustable furring brackets in accordance with manufacturer's directions.
 5. Splicing Members: Lap furring members 8 inches and runner channels 12 inches and wire-tie near each end of lap.

3.5 SHAFT WALL INSTALLATION

- A. Shaft Wall Installation, General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.
1. Anchor components to comply with ratings and performance requirements, and with governing regulations.
 2. Isolate shaft system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
 3. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- B. Supplementary Framing: Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
- C. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- D. Sprayed Fire-Resistive Materials: Coordinate gypsum board shaft system work with sprayed-on fireproofing of structure, so that both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during installation of shaft framing system.

3.6 SUSPENSION SYSTEM INSTALLATION

- A. Suspended Assemblies, General: ASTM C 754.
1. Install ceiling framing independent of walls, columns, and above ceiling work.
 2. Do not bridge building expansion joints with support system.

3. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet measured lengthwise on each member transversely between parallel members.
- B. Hangers: Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
1. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - a. Space hanger wires 48 inches o.c. along carrying channels and within 6 inches of ends of channel run. Anchor hanger wires to supporting structure. Do not attach hangers to metal deck tabs.
 2. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 3. Coordinate location of hangers with other work.
 - a. Do not attach hangers to steel roof deck.
 - b. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - c. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - d. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- C. Carrying Channels: Position channels at proper height and level, and secure with hanger wires.
1. Space main carrying channels at maximum 48 inches on center, not more than 6 inches from perimeter walls.
 2. Lap splices minimum 12 inches and secure together 2 inches from each end of splice. Provide clearance between channels and abutting walls or partitions.
- D. Furring Channels: Comply with Gypsum Association GA-203.
1. Place furring channels perpendicular to carrying channels at 16 inches on center not more than 6 inches from perimeter walls.
 2. Lap splices minimum 8 inches and secure together one inch from each end of splice.
 3. Provide clearance between furring and abutting walls or partitions. Secure furring to carrying channels with clips.
 4. Frame both sides of joints with furring and other supports.
 5. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Lateral Bracing: Laterally brace entire suspension system where required. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.

3.7 GRID SUSPENSION SYSTEM INSTALLATION

- A. Suspension Grid Systems: Install in accordance with Manufacturer's instructions.
1. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces.
 2. Install main beams and cross tees at the on center spacing required for ceiling loading, and location of in-ceiling services.
 3. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
 4. Provide additional bracing as required by code.
- B. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces.
- C. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

END OF SECTION

SECTION 09 29 00 GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board (GYP BD).
 - 2. Acoustic insulation (INSUL-40) and sealant.
 - 3. Gypsum assembly accessories (GYPA).

1.2 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Convene a pre-installation meeting at the beginning of the project to review acoustically rated construction requirements and to coordinate penetrations.
 - 1. Architect, Contractor, Owner's representative and each trade that may need to penetrate acoustically rated construction or will be involved in construction of acoustically rated partitions and related systems must attend.
 - 2. Review layouts and routing for potential penetrating items, discuss reducing or eliminating penetrating items by considering alternate routing, review construction requirements, details and specifications for acoustically rated construction.
 - 3. A follow-up meeting should be scheduled as needed.
 - 4. This meeting can occur in conjunction with a regular construction progress meeting.
 - 5. Publish meeting minutes highlighting topics discussed, actions items and decision made.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For accessories exposed to view in final installation.
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation scheduled to receive Level 5 Finish, install panel mockup, 48 inches wide by 96 inches tall, demonstrating at least 2 vertical and 2 horizontal joints, for Architects review of aesthetic effects workmanship.
 - 1. Apply or install final finish indicated, including painting, on exposed surfaces for review of mockups.
 - 2. Simulate finished lighting conditions for review of mockups.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 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.
 - 1. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.

1. Cold Weather Protection: When ambient outdoor temperatures are below 55 degrees F maintain continuous, uniform, comfortable building working temperatures of not less than 55 degrees F for minimum period of 48 hours prior to, during and following application of gypsum board and joint treatment materials or bonding of adhesives.
 2. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.
- B. Damaged Materials: Do not install 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.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory." GA-600, "Fire Resistance Design Manual."
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."
- C. Shaft Wall Assemblies: Provide gypsum board shaft wall system design and tested by manufacturer to withstand lateral loading (air pressure) of 10 lbs per sq ft for maximum wall height required, and with deflection limited to 1/240.
1. Refer to Section 092200 - Non-Structural Metal Framing for shaft wall studs.
- D. Ceiling and Wall Materials: Provide materials that comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 MANUFACTURERS

- A. Manufacturers:
1. United States Gypsum.
 2. National Gypsum Company.
 3. Georgia-Pacific.
 4. CertainTeed Corporation.
 5. Temple-Inland.

2.3 GYPSUM PANEL PRODUCTS

- A. Gypsum Board, General: ASTM C1396, asbestos-free, and in accordance with GA 216.
- B. Gypsum Board Products, General: In accordance with ASTM C 1396, and other specified requirements, and as follows:
1. Provide products that do not contain asbestos.
 2. Provide products in accordance with recommendations of GA 216 - Application and Finishing of Gypsum Panel Products.
 3. Provide products in maximum lengths and widths available to minimize joints and to correspond with support system indicated.

- C. (GYP BD-1) Fire-Rated Board: Type X, 5/8 inch thick.
- D. (GYP BD-2) Moisture- and Mold-Resistant Board, Type X: With moisture- and mold-resistant paper surfaces and core. Provide mold and water-resistant gypsum board as required by local building code and as indicated
 - 1. Thickness: 5/8 inch.
 - 2. Mold Resistance: ASTM D 3273, score of 10.
 - 3. Products and Manufacturers:
 - a. ProRoc M2Tech by CertainTeed.
 - b. ToughRock Mold-Guard by Georgia-Pacific.
 - c. Sheetrock Mold Tough Firecode by United States Gypsum (USG).
- E. (GYP BD-21) Gypsum Shaft Liner: One inch thick shaft wall liner panel with moisture resistant paper facing. Square edges designed for installation into I, C-H, E, or H metal studs.
 - 1. Acceptable Manufacturer, Paper Faced: ASTM C1396.
 - a. United States Gypsum Company: SHEETROCK Brand Gypsum Liner Panels.
 - b. National Gypsum Company: Gold Bond Brand Fire-Shield Shaftliner.
 - c. G-P Gypsum Corp.: ToughRock Shaftliner.
 - 2. Acceptable Manufacturer, Moisture and Mold Resistant Paper Faced, ASTM D3273 score of 10:
 - a. United States Gypsum Company: SHEETROCK Brand Mold Tough Gypsum Liner Panels.
 - b. National Gypsum Company: Gold Bond Brand Fire-Shield Shaftliner XP.
 - c. CertainTeed Corp.: M2Tech Shaftliner Type X.
 - 3. Acceptable Manufacturer, Glass Mat Faced, ASTM C1658:
 - a. CertainTeed Corp.: GlasRock Shaftliner Type X.
 - b. G-P Gypsum Co.: DensGlass Shaftliner.
 - c. National Gypsum Company: eXP Shaftliner.
 - d. United States Gypsum Company: SHEETROCK Brand Glass-Mat Liner Panels.
- F. (GYP BD-35) Abuse-Resistant Mold-Resistant Board: ASTM C1396, ASTM D3272 score of 10 and ASTM C1629 for abuse resistance, manufactured to produce greater resistance to surface abrasion and indentation than standard gypsum panels.
 - 1. Products:
 - a. National Gypsum Company; Gold Bond Brand Hi-Abuse XP Gypsum Board.
 - b. United States Gypsum Co.; SHEETROCK Brand Mold Tough Abuse-Resistant Firecode X Panels.
 - c. CertainTeed Corp.: AirRenew Extreme Abuse Gypsum Board.
 - 2. ASTM C1629: Surface Abrasion Level 3, Indentation Level 1, Soft Body Impact Level 2.
 - 3. Core: 5/8 inch, Type X.
 - 4. Long Edges: Tapered.

2.4 TILE BACKER BOARDS

- A. General: Provide mold- and water-resistant tile backer boards specified.
 - 1. Mold Resistance Requirement: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 - 2. Provide cementitious tile backer boards for tile installation at showers and other high-moisture areas, and as indicated on Drawings.
 - 3. Contractor's Option: Provide water-resistant gypsum backing boards in lieu of cementitious backer boards for applications other than showers or high-moisture areas, and as submitted to and accepted by Architect.
- B. (GYP BD-23) Cementitious Backer Board: ANSI A118.9 and ASTM C 1325, aggregated portland cement board, reinforced with imbedded glass-fiber mesh at both faces and at long edges.
 - 1. Core: 1/2 inch thick.
 - 2. Edges: Square and smooth, reinforced.
 - 3. Manufacturers and Products:
 - a. Custom Building Products; Wonderboard.

- b. USG Corporation; DUROCK Cement Board.
 - c. National Gypsum Company; PermaBase Cement Board.
- C. Glass-Fiber-Faced Water-Resistant Gypsum Backing Board (Option): ASTM C1178, mold- and water-resistant gypsum wallboard, with coated glass-fiber mat at both faces and at long edges, with moisture retarding acrylic coating on one face.
 - 1. Core: 1/2 inch thick, regular type.
 - 2. Edges: Square.
 - 3. Manufacturers and Products:
 - a. DensShield Tile Backer Board by G-P Gypsum Corporation. GlasRoc Diamondback Tile Backer Board by CertainTeed Corporation.
 - b. eXP Tile Backer by National Gypsum Company.
 - c. Durock Glass-Mat Tile Backerboard by United States Gypsum Corp.
- D. Tile Backer Board Accessories:
 - 1. Fasteners: As recommended by backer board manufacturer.
 - 2. Tile-Setting Mortar for Joint Treatment: As specified with Section 093000 - Tiling.
 - 3. Joint Tape: Alkali-resistant fiberglass mesh tape, 2-inches wide, or as recommended by backer board manufacturer.
 - 4. Sealants: As specified in Section 079200 - Joint Sealants .

2.5 INSTALLATION AND FINISHING ACCESSORIES

- A. General: Provide auxiliary materials and accessories that comply with referenced installation standards and manufacturer's written instructions.
- B. Trim Accessories: ASTM C 1047.
 - 1. Materials: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- C. Joint Treatment Materials for Gypsum Board: Comply with ASTM C 475.
 - 1. Joint Tape: Paper.
 - 2. Joint Compound: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - a. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - 1) Use setting-type compound for installing paper-faced metal trim accessories.
 - c. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - d. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - e. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound, or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat compound to produce Level 5 finish.
 - 3. Control Joints: Dietrich Zinc Control Joint No. 093
- D. Fasteners and Anchorages: GA 216, type and size as recommended by board manufacturer.
- E. Fasteners: Use self-tapping or appropriate threaded fastener, compatible with all materials fasteners will contact with and not causing galvanic corrosion.
- F. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- G. Adhesive: USG Durabond, as recommended by wallboard manufacturer for wood framing.
- H. Laminating Adhesive: Joint compound or adhesive as recommended by gypsum board manufacturer for laminating gypsum board face layer to gypsum board base layer.
- 1. Approved Product for Use at Noise Critical Spaces: Green Glue by Certainteed.**
- I. Joint Sealant (Non-Acoustic): As specified in Section 079000 - Joint Protection.

2.6 ACOUSTIC INSULATION

- A. Insulation is required to be formaldehyde-free or GreenGuard Indoor Air Quality Certified.
- B. (INSUL-40) Unfaced, Sound Attenuation Glass-Fiber Blanket Insulation: ASTM C 665, Type I; formaldehyde-free and GreenGuard Indoor Air Quality Certified; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. Products and Manufacturers:
 - a. NoiseReducer by CertainTeed Corporation.
 - b. Sound Attenuation Batts or QuietZone Acoustic Batts by Owens Corning.
- C. (INSUL-41) Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. Provide at interior partitions. Glass fiber insulation is not allowed at interior partitions.
 2. Density: 2.5 pcf
 3. Thickness: Same as stud depth or as indicated.
 4. Width of Batts: Center to center dimension of metal studs and full face to face at other voids.
 5. Manufacturers:
 - a. Fibrex Insulations Inc.
 - b. Owens Corning; SAFB-MW
 - c. USG; Thermafiber.
 - d. Rockwool
- D. Manufacturers and Product:
1. *Johns Manville: Formaldehyde-Free and Unfaced Sound Control Batts.*
 2. *Owens Corning: Fiberglas Sound Attenuation Batts.*
 3. *Certainteed: CertaPro AcoustaTherm Batts.*
 4. *Thermafiber: Sound Attenuation Fire Blankets (SAFB).*

2.7 ACOUSTIC SEALANT

- A. Acoustical Sealant, General:
1. Provide low emitting sealants meeting SCQAMD rules.
 2. Sealants Composition and VOC Limits: In compliance with applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168.
- B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 and ASTM C 919 that 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. Pecora AC-20 FTR Acoustical and Insulation Sealant.
 2. United States Gypsum Co. SHEETROCK Acoustical Sealant.
 3. Hilti Incorporated CP 506 Acoustical Sealant

- C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
 - 1. Non-hardening polyurethane type, ASTM C920, Type M, Class 25, Grade NS: Tremco Dymeric 511; or approved equal.
 - 2. Non-hardening polysulphide type, ASTM C920, one-part: Pecora GC-9; or approved equal.
 - 3. Non-hardening silicone type, ASTM C920, Type S, Class 25, Grade NS, one-part, low modulus type: GE Silpruf, Dow Corning 790, Tremco Spectrum 1, Pecora 864, or approved equal.
- D. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
 - 1. *Ohio Sealants, Inc. Pro-Series SC-170 Rubber Base Sound Sealant.*
 - 2. *Pecora Corp. BA-98.*
 - 3. *Tremco, Inc. Tremco Acoustical Sealant.*
- E. Fire-Rated Joint Sealant: (FRJS) as specified in Section 078443 - Joint Firestopping.
- F. Back-Box Putty: Moldable putty and accessories as recommended by Manufacturer.
 - 1. SpecSeal SSP Intumescent Putty, Specified Technologies, Inc., Somerville, NJ
 - 2. IsoBacker, Kinetics Noise Products
 - 3. Firestop Putty Pads, Acoustical Solutions
- G. Closed-Cell Tape Sponge Neoprene: Press-on Products, No. P-8200 or P-8100, or approved equal.
- H. Foam Backer Rod: Closed cell polyethylene, ASTM C962; size 30 percent greater than the joint width, unless otherwise indicated on details.
 - 1. Manufacturers:
 - a. ITP.
 - b. Nomeco.

2.8 ARCHITECTURAL TRIM

- A. (GYPA) Extruded Aluminum Profile Trim, Reveals, and Moldings: Alloy 6063-T5, ASTM B 221.
 - 1. Basis of Design: As indicated on Material Identification List.
 - 2. Finish: Prefinished or field-painted as indicated on Material Identification List.
- B. Manufacturers: Provide specified products or equivalent products by one of the following:
 - 1. Gordon Incorporated.
 - 2. Fry Reglet Corporation.
 - 3. Pittcon Industries.
- C. Profile Schedule: Provide profile, size and finish [as indicated on Material Identification List] [as scheduled below]:
 - 1. (GYPA-_) F-Reveal: DRMF or FDM Series by Fry Reglet.
 - 2. (GYPA-_) J-Molding: JDM Series by Fry Reglet.
 - 3. (GYPA-_) L-Trim Molding: DRML Series by Fry Reglet.
 - 4. (GYPA-_) V-Joint:
 - 5. (GYPA-_) Z-Reveal: DRMZ Series by Fry Reglet.
 - 6. (GYPA-_) Corner Trim: DMCT Series by Fry Reglet.
 - 7. (GYPA-_) Curved Outside Corner: DRMC-OS Series by Fry Reglet.
 - 8. (GYPA-_) 45-Degree Outside Corner Bead: Pittcon SO-45A
 - 9. (GYPA-_) Wall End Closure DMEC Series by Fry Reglet.
 - 10. (GYPA-_) Edge Trim: DMET Series by Fry Reglet.
 - 11. (GYPA-_) Heavy-Duty Corner Guard:
 - 12. (GYPA-_) Wall Base: Series 800 by Gordon Interiors.
 - 13. (GYPA-_) Wall Reveal: DRM Series by Fry Reglet.
 - 14. (GYPA-_) Wall Reveal: Series 300 by Gordon Interiors
 - 15. (GYPA-_) Knife Edge Trim: FWT-150 by Pittcon.
 - 16. (GYPA-_) Control joint:

17. (GYPA-__) Wall Corner, Acute Angle: Series 981 by Gordon Interiors
18. (GYPA-__) Custom Outside Corner Trim, Various Angles: Provide custom aluminum trim with angle profile as shown on Drawings. By Pittcon or Fry Reglet.

D. Size:

E. Finish:

1. Field-painted to match adjacent wall.
2. Clear-Anodized:
3. Color-Anodized:
4. Prefinished Painted:

2.9 OTHER WALL COMPONENTS

- A. (VR-1) Polyethylene Vapor Retarder: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.
 1. Seam Tape at Vapor Retarders: Minimum 2 inches wide, pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- B. (FRP-__) Bullet-Resistant Fiberglass-Reinforced Wall Panels: Provide non-ricochet type panels fabricated of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets; tested and certified to achieve panel rating of UL752 Level 1.
 1. Basis of Design: ArmorCore by Waco Composites.
- C. (WBM-1) Wall Barrier Security Mesh: 3/4" diamond mesh, galvanized steel, 13 ga., 0.92" x 2.10".
 1. Basis of Design: BM75 Barrier Mesh System with Barrier Mesh Clips by ClarkDietrich.

PART 3 EXECUTION

3.1 GYPSUM BOARD INSTALLATION

- A. Install and finish gypsum board and accessories in accordance with manufacturer's printed instructions and comply with recommendations of GA 216 and ASTM C840, including appendixes. Verify control joint locations at walls and ceilings with Architect.
- B. Minimize butt joints by using gypsum board of maximum length possible. If cut butt joints are unavoidable, locate end butt joints as far from center of walls or ceilings as possible and stagger not less than 12 inches in alternate courses of board.
- C. Do not install imperfect, damaged, damp or wet gypsum board.
- D. Abut boards together for light contact at edges or ends with not more than 1/16 inch open space between boards. Do not force into place.
- E. Locate edges and joints over supports or back-blocking except in horizontal applications. Position gypsum board so that both tapered edge joints and cut edges abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partition/walls.
 1. Form curved surfaces by carefully bending and fastening board to smooth even curve, free of flat or distorted areas and other imperfections. Comply with manufacturer's instructions for dampening of sheets or scoring of back face, if required to form to radius shown.
 2. Hold gypsum board 1/4 inch above floor at each type of partition.
- F. Install solid and semisolid drywall partitions made-up of coreboard or gypsum board studs with face courses of exposed gypsum board, laminated with both adhesive and screws.
- G. Isolate gypsum surfaces with control joints or other stress relief where:
 1. Partition or furring abuts structural element (except floor) or dissimilar wall or ceiling.
 2. Ceiling abuts structural element, dissimilar wall or partition or other vertical penetration.
 3. Construction changes within plane of partition or ceiling.

4. Partition or furring run exceeds 30 feet.
 5. Ceiling dimensions exceed 30 feet in either direction.
 6. Wings of "L", "U" and "T" shaped ceiling areas are joined.
 7. Expansion joints occur in exterior wall if expansion joints are not used.
 8. Where control joint is near a door opening, locate and align control joint with edge of door frame.
 - a. Ceiling height door frames may be used as control joints.
 - b. Where door frames are less than ceiling height, extend control joints to ceiling from both corners
 9. Review location of joints with Architect.
- H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- I. Provide perimeter isolation where non-load-bearing partitions abut structural decks or ceilings, or vertical structural elements. Allow not less than 1/4 inch, or more than 1/2 inch gap between gypsum and structure. Finish edges of face layer with casing bead. Seal space between casing bead and structure with continuous acoustical sealant bead. Do not attach board directly to tracks.
- J. Cutting, Fitting and Trimming: Accurately measure and precut gypsum drywall units prior to installation. Make cuts from face side by scoring and snapping away from face side or by sawing. Completely cut paper on back face; do not break paper by tearing. Maintain close tolerances for accurate fit at joints between sheets and at framed openings, and allow for covering of edges of cut-outs with plates and escutcheons. Cut edges smooth as required for neat and accurate fit.
- K. Begin fastening from center portion of sheet and work toward edges and ends. Ensure contact of drywall with supports by applying pressure on surface adjacent to fastener being driven. Do not locate fasteners closer than 3/8 inch from edges or ends of sheets. Drive with shank approximately perpendicular to drywall surface.
- L. Drive screws with power screwdriver recommended by drywall manufacturer. Do not hammer drive screws. Set screw heads slightly below surface of drywall, but do not break or strip paper face around screw. Stagger screws on edges and ends of adjacent sheets.
- M. For fire-rated Walls: Fasten to metal framing and furring with screws. Comply with drywall manufacturer's instructions and UL requirements for fastening, but do not exceed 8 inches on center at perimeter and 12 inches on center spacing at the field. Space fasteners not less than 1/4 inch from edges and ends of gypsum drywall.
1. For Non-rated Walls: Fasten perimeter and field at 12 inches on center.
 2. For multilayer fire-rated walls: Comply with UL requirements.
 3. For Acoustical Walls: Comply with fire-rated wall UL requirements.
- N. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
1. Z-Furring Members: Apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
- O. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.2 ACOUSTICALLY RATED PARTITIONS

- A. Where acoustically rated partitions are shown, provide complete air tight, acoustical rated assembly meeting or exceeding requirements of Sound Transmission Class (STC) ratings per manufacturer's requirements and GA 600 for sound control requirements.
- B. Do not penetrate acoustically rated partitions without authorization from Architect.
- C. Stagger joints between layers of gypsum board and install gypsum board to be continuous between adjacent rooms.
- D. Fit gypsum board tightly around structural elements.
- E. Install continuous acoustical sealant at:
 - 1. Entire perimeter of wall on each side of top, bottom and side of walls.
 - 2. Intersection at change of plane and change of material.
 - 3. Gaps between service outlets and gypsum board
 - 4. Each penetration.
 - 5. Structural elements.
 - 6. All penetrations of partition, wall, and floor construction by ductwork, conduit, piping, or structure.
 - 7. All termination of partitions enclosing Noise Critical Spaces to abutting construction (e.g. partitions, structure, etc.)
 - 8. Both sides of door frames to abutting construction where doors are scheduled to have acoustical seals.
 - 9. Both sides of window frames to adjacent construction.
 - 10. Perimeter of and penetrations through sound isolating ceilings, roof systems, and floor systems.
- F. Seal entire back of service boxes.
- G. Seal gaps around penetrations as follows:
 - 1. One inch or less gap filled tightly with batt insulation and apply sealant.
 - 2. One inch or greater gap fill with acoustical insulation and moldable putty.
- H. Acoustical Sealant Installation: Provide acoustical sealant at the following locations:
 - 1. At penetrations of partition, wall, and floor construction by ductwork, conduit, piping, or structure.
 - 2. At termination of partitions enclosing Noise Critical Spaces to abutting construction (e.g. partitions, structure, etc.)
 - 3. At both sides of door frames to abutting construction where doors are scheduled to have acoustical seals.
 - 4. At both sides of window frames to adjacent construction
 - 5. At perimeter of and penetrations through sound isolating ceilings, roof systems, and floor systems.
 - 6. Provide backer rod at all acoustical sealant joints..

3.3 INSTALLATION OF TILE BACKER BOARD

- A. Comply with manufacturer's written instructions for installation and finishing.
 - 1. Cementitious Backer Boards: ANSI A108.11.
 - 2. Install backerboard, leaving a 1/8-inch to 3/16-inch gap at all joints and corners. Stagger board joints with those of adjacent rows.
 - 3. Fasten backerboard every 8-inches o.c. along framing members.
 - 4. Fill gaps solid with latex Portland cement mortar and embed 2-inch alkali resistant fiberglass tape.
- B. Tape joints in backer board as recommended by board manufacturer. Seal ends, cut-edges and penetrations of each piece with tile setting mortar or water-resistant adhesive, and then immediately imbed tape and level joints.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

- D. **Installation Tolerances:** Board faces shall not vary from plane greater than 1/8-inch in 10 feet.
- E. Comply with backer board manufacturer's written instructions for installation and finishing, and as specified herein.
 - 1. Coordinate with Section 079200 - Joint Sealants and Section 093000 - Tiling.
 - 2. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.
- F. **Cementitious Backer Boards:** Install in accordance with ANSI A108.11.
 - 1. Stagger board joints with those of adjacent rows.
 - 2. Place panels with 1/8-inch to 3/16-inch gap at all joints and corners.
 - 3. Drive nails or screws flush with surface. Do not countersink fasteners.
 - 4. Do not use drywall nails or screws. Do not use drywall joint tape or joint compound.
 - 5. Apply sealant to penetrations around pipes and fixtures.
 - 6. Grout solid all gaps with tile-setting mortar.
 - 7. Treat joints and corners with alkali-resistant mesh tape, embedded in skim coat of tile-setting mortar.
- G. **Glass-Fiber-Faced Water-Resistant Gypsum Backing Boards:** Install in accordance with ASTM C840.
 - 1. Do not use water-resistant gypsum backing boards at showers or other high-moisture installations, or at exterior installations.
 - 2. Stagger board joints with those of adjacent rows.
 - 3. Drive nails or screws flush with surface. Do not countersink fasteners.
 - 4. Apply sealant to all cut edges of board and all fastener penetrations.
 - 5. Apply sealant to penetrations around pipes and fixtures.
 - 6. Grout solid all gaps with tile-setting mortar.
 - 7. Treat joints and corners with alkali-resistant mesh tape, embedded in skim coat of tile-setting mortar.

3.4 ACCESSORIES INSTALLATION

- A. **Acoustical Insulation:** Install blankets in accordance with manufacturer's printed instructions, with tight joints in blanket units. Use tape, adhesive or staples to hold blankets in place.
 - 1. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions and tight to items passing through partitions.
- B. **Drywall Sealant:** Seal perimeter of sound-rated partitions by filling open space between drywall and floor or ceiling construction with continuous bead of sealant. Fill open spaces between drywall and fixtures, cabinets and other flush or penetrating items with continuous bead of sealant. Seal sides and back of electrical boxes to completely close up openings and joints. Seal perimeter of wallboard shaft wall where it abuts other work.
 - 1. Apply joint sealant in accordance with Section 079000 - Joint Protection.
- C. **Adhesive Application:** Use adhesive recommended by manufacturer for type of substrate indicated. Prepare substrate and laminate wallboard in accordance with manufacturer's printed instructions. Provide temporary fasteners or bracing as recommended until adhesive sets.
- D. Reinforce external corners of drywall with metal corner bead. Securely fasten metal corner beads, edge trim casing beads and control joints.

3.5 SHAFT WALL INSTALLATION

- A. Anchor and fasten materials and components to comply with ratings and performance requirements, and to comply with governing regulations.
- B. Coordinate gypsum board shaft system work with sprayed-on fireproofing of structure, so that both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during installation of shaft system.

- C. Seal perimeter of each section of gypsum board shaft work where it abuts other work. Install second bead of acoustical sealant in location and manner which will prevent dislocation by air pressure differential between shaft and external spaces. Seal joints and penetrations in work; comply with manufacturer's instructions.

3.6 FINISHING

- A. Finish exposed drywall surfaces with joints, corners and exposed edges reinforced or trimmed and with joints, fastener heads, trim accessory flanges and surface defects filled with joint compound in accordance with drywall manufacturer's recommendations for smooth, flush surface. Form true, level or plumb lines, without joints, fastener heads, flanges of trim accessories or defects visible after application of field-applied decoration. Exposed metal trim (not filled) will not be acceptable.
- B. Use joint tape to reinforce joints formed by tapered edges or butt ends of drywall units and at interior corners and angles. Set tape in joint compound and apply skim coat over tape in one application. Do not use topping or finishing compounds for setting of tapes.
- C. Apply joint compound to joint. Apply joint compound to fill holes left from removal of screws at intermediate studs. Finish gypsum drywall thereafter, including sanding of final coat, in accordance with ASTM C840.
- D. Where open spaces of more than 1/16 inch width occur between abutting drywall units, except at control joints, prefill joints with joint compound and allow prefill to dry before application of joint tape.
- E. Finish Levels of Joints in Interior Gypsum Board Work:
 - 1. Level 0: No taping, finishing, or accessories required.
 - a. Use above suspended ceilings and within other concealed spaces, unless assembly is fire rated, sound rated, sound or smoke controlled, or unless space serves as air plenum.
 - 2. Level 1: At joints and interior angles embed tape in joint compound. Leave surface free of excess joint compound. Tool marks and ridges are acceptable.
 - 3. Level 2: At joints and interior angles embed tape in joint compound with one separate coat of joint compound applied over joints, angles, fastener heads, and accessories.
 - a. Use for mold and water resistant gypsum board indicated for use as a substrate for ceramic tile.
 - b. Use for gypsum board indicated for use as a substrate for wood paneling or acoustical panels.
 - c. Use above suspended ceilings and within other concealed spaces if gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or space serves as air plenum.
 - 4. Level 3: At joints and interior angles embed tape in joint compound with 2 separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges.
 - a. Use where heavy grade wall covering is final decoration.
 - b. Use where gypsum board is base for acoustical ceiling tile.
 - 5. Level 4: At joints and interior angles embed tape in joint compound with 3 separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges.
 - a. Use for all locations, except those indicated for other finish levels.
 - 6. Level 5: At joints and interior angles embed tape in joint compound with 3 separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Apply thin skim coat, as specified in Joint Treatment Materials Article above, to entire surface. Leave surface smooth and free of tool marks and ridges.
 - a. Use where semi-gloss or gloss finish coatings are final decoration.
 - b. Use for 2 story walls with direct natural day lighting (Lobbies, Entries, Rooms with large day lighting and long walls perpendicular to windows).
 - c. Use at ceilings in Lobbies, assembly areas with direct natural day lighting.
 - d. Use where skim coat finish is indicated.
 - e. On surfaces scheduled to receive wall coverings.

- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- G. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 - 1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 - 2. Before notifying Architect, verify installation of mechanical, electrical and other facility services work and Installation of ceiling support framing in areas to receive gypsum board ceilings.

3.8 INSTALLED WORK

- 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.

END OF SECTION

SECTION 09 65 00 RESILIENT FLOORING

Section Revised DSI0004, 27 AUG 2021

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient floor tile (RFT).
 - 2. Resilient sheet flooring (RSF).
 - 3. Resilient wall base (RB).
 - 1. Resilient transition strips (TRS).
 - 2. Resilient flooring accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

- A. Slab Moisture Content and Calcium Chloride Test Results.
- B. Compatibility Certification: Submit approval documentation by both flooring manufacturer and adhesive manufacturer as compatible with substrate, flooring, project conditions, use, expected traffic, equipment loads and surface conditions including alkalinity, moisture emission levels, slab relative humidity, and other factors that may affect flooring and adhesive performance.
- C. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Materials (Attic Stock): Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every **50** boxes, or fraction thereof, of each type, color, and pattern of floor tile installed.
 - 2. Sheet Floor Covering: Furnish not less than 10 linear ft. for every 500 linear ft., or fraction thereof, in roll form and in full roll width for each color, pattern, and type of sheet floor covering installed.
 - 3. (RB) Resilient Base: Furnish not less than 5 percent of total linear feet installed.
 - 4. Other Replacement Materials: Furnish not less than one percent of total project quantity of each type, size and color of material to Owner for replacement materials. Clearly identify each container of replacement materials.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation.

1.6 FIELD CONDITIONS

- A. Deliver resilient flooring materials in manufacturer's protective packaging. Store and handle flooring with care to prevent damage.

- B. 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 floor coverings during the following time periods:
 - 1. 72 hours before installation.
 - 2. During installation.
 - 3. 72 hours after installation.
- C. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- D. Install floor coverings after other finishing operations, including painting, have been completed.
- E. Close spaces to traffic during floor covering installation and for 72 hours after floor covering installation.
- F. General Contractor shall be responsible for conducting one calcium chloride test for every 1,000 square feet (minimum of 3 tests) to insure concrete moisture emissions do not exceed 5.0 lbs per 1,000 square feet within a 24-hour period.

PART 2 PRODUCTS

2.1 RESILIENT PRODUCTS

- B. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Products, General:
 - 1. Basis of Design: Refer to Material Identification List for product selections and product information such as colors, finishes, and accessories.
 - 2. Single Source: Provide each type of resilient flooring produced by single manufacturer, single run.
 - 3. Slip Resistance of Flooring Materials: Provide materials with 0.6 coefficient of friction or greater when tested in accordance with ASTM 2047.

2.1 VINYL FLOORING

- D. (RFT) Luxury Vinyl Tile (LVT): ASTM F 1700 Class III, Type B (Embossed).

2.2 RUBBER FLOORING

- E. (RSF) Rubber Sheet Flooring: ASTM F1859 (unbacked) or ASTM F 1860 (with backing), Type I (homogeneous rubber sheet).

2.3 WALL BASE

- A. (RB) Rubber Wall Base: ASTM F 1861, Type TS, Group 1, Styles A and B. Provide in 120-foot long rolls. Provide standard top-set cove base, except provide straight base at carpet.
 - 1. Basis of Design: As indicated on Material Identification Codes List.
 - 2. ASTM E 84; Class B rating with smoke density of 150-200.
- B. (RTS) Resilient Floor Finish Transition Strips:
 - 1. Basis of Design: As indicated on Material Identification Codes List.

2.4 ACCESSORIES

- F. (TRS) Transition Edge Strips: Provide at edges of resilient flooring wherever edge is exposed.
 - 1. Type, Material, Profile and Color: Refer to Material Identification List..
- G. Heat-Welding Bead: Solid-strand product of linoleum floor covering manufacturer.
 - 1. As selected by Architect from manufacturer's full range.
- H. Integral-Flash-Cove-Base Accessories:
 - 1. Cove Strip: 1-inch radius provided or approved by manufacturer.

2. Cove-Base Cap Strip: Square metal, provided or approved by manufacturer.

2.5 INSTALLATION ACCESSORIES

- 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. Skim Coat: Portland cement-based, trowel-applied skim coat intended for thin application over rough or abrasive surfaces to create a smooth prepared surface to receive resilient flooring.
 1. Extent: At stair treads and landings in P1, P2 and P3.
 2. Primer: As recommended by and manufactured by concrete topping Manufacturer.
 3. Aggregate: Well washed, graded, fine gravel or larger aggregate as recommended by Manufacturer.
- C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 1. VOC Content: Comply with the following limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT Adhesives: Not more than 50 g/L.
 - b. Cove Base Adhesives: Not more than 50 g/L.
 - c. Rubber Floor Adhesives: Not more than 60 g/L.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.
- E. Sealer and Wax: Type recommended by resilient flooring material manufacturer for material type and location.

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.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. 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 floor coverings.
- B. Concrete Substrates: 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 floor covering 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. Proceed with installation only after substrates pass testing.
 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- 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 floor coverings until they are same temperature as space where they are to be installed. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.
- E. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.1 RESILIENT SHEET FLOORING INSTALLATION

- I. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- J. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- K. Lay out resilient sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Avoid cross seams.
- L. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- M. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

- N. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- O. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 INSTALLED WORK

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering 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 floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor coverings before applying liquid floor polish.

END OF SECTION

SECTION 09 72 16 RIGID-SHEET VINYL WALL COVERING

Section Added DSI0004, 27 AUG 2021

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section includes labor, materials and other services necessary to install a rigid-sheet vinyl wall covering (RVWC).

1.2 REFERENCES

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. American Society for Testing & Materials (ASTM):
 - 1. AST ASTM E 84-05 Standard Test Method for Surface Burning Characteristics of Building Materials. CLASS A.
 - 2. ASTM D5420 Gardner Impact Exceeds 160 inch pounds.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's current printed product literature, specifications, installation instructions, and field reports in accordance with Section 01 33 00 - Submittal Procedures.
- B. Shop Drawings: Submit shop drawings to indicate materials, details, and accessories in accordance with Section 01 33 00 - Submittal Procedures including but limited to the following:
 - 1. Submit a layout diagram indicating the location of each panel and joining method.
- C. Samples: Submit duplicate sample pieces of material, as well as accessory pieces in accordance with Section 01 33 00 - Submittal Procedures.
- D. Quality Assurance Submittals: Submit the following:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Manufacturer's Instructions: Current published manufacturer's installation and maintenance instructions.
 - 3. Manufacturer's Field Reports: Specified herein.
- E. Closeout Submittals: Submit the following:
 - 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 01 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials, and methods detrimental to finishes and performance.
 - 2. Warranty: Warranty documents specified herein.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - 1. Training: Manufacturer certified installer who has attended an installation training clinic.
- B. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.
- D. Store panels in temperature controlled environments. Leave protective blue film on panel until ready to use.

1.6 WASTE MANAGEMENT AND DISPOSAL

- A. Deposit packaging materials in appropriate container on site for recycling or reuse.
- B. Avoid using landfill waste disposal procedures when recycling facilities are available.
- C. Keep all discarded packaging away from children.

1.7 PROJECT CONDITIONS

- A. Temperature Requirements: If storage temperature is below 65F (18C), the wall panel must be moved to a warmer place and allowed to reach this temperature before installation. For further information, refer to current Installation Guide.
- B. Maintain air temperature and structural base temperature at installation area between 65F (18C) and 80F (26C) for 48 hours before, during and 24 hours after installation.

1.8 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, 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 Contract Documents.
- C. Warranty Period shall be 10 years, commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 HYGIENIC WALL COVERINGS

- 1. Acceptable material (RVWC-1): Inpro, Sani-Surface Hygienic Cladding
- 2. Color: Cream 41; Thickness: 2.0 mm; Panel Width: 4', Panel Height: 10'.

2.2 ACCESSORIES

- A. Top caps, inside corners, divider bars and outside corners shall be made of extruded PVC.
- B. Color Matched Caulk
- C. Two-Part Urethane Waterproof Sealant
- D. Adhesive: Titebond GREENchoice Fast Grab FRP Construction,

2.3 FINISHES

- A. Sani-Surface Hygienic Wall Cladding colors to be selected by the architect. Surface shall have a velvet texture.
- B. Vinyl Accessories: Top caps, inside corners, divider bars and outside corners shall be of a color matching the panel.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog, installation instructions, and product label instructions for installation.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 SUBSTRATE PREPARATION

1. Walls should be smooth and level. High points must be removed and low points filled with filler intended for the substrate and environmental conditions.
2. Surfaces must be permanently dry and free from all substances that may contribute to adhesive bond failure.
3. Cement board substrates should be clean and dry with joints taped and filled.
4. Conduct an adhesive bond test.

3.4 PREPARATION

- A. All surfaces must be free from dust and cleaned prior to installation. The working environment is to be dust-free.
- B. Very absorbent / porous substrates (particularly plaster finishes and unprimed sheetrock) must have a proprietary sealer e.g. PVA primer or similar, applied to the surface a minimum of 12 hours prior to the installation.
- C. All electrical switches, power points etc., should be in a first fix / installation state. All electrical equipment should only be moved or altered by a qualified electrician.
- D. All plumbing should have pipe-work removed to a first fix or installation state and "tails" left protruding from the substrate. Panels can then be drilled and slid over the pipe tails. All holes should be drilled 1/8" (3mm) oversize to allow for expansion, then sealed with Manufacturer's caulking. Plumbing should always be done by a qualified plumber.
- E. Hot pipes and steam pipes should be insulated and a 1/8" to 1/4" (3-6mm) expansion gap should be created when installing panels around these pipes, then sealed with Manufacturer's caulking.
- F. All pipes, fixing bolts, etc. extending through the panels should have a minimum 1/8" (3mm) expansion gap and be sealed using Manufacturer's caulking.
- G. If fitting to door frames, these must be in place prior to installation.
- H. Prior to installation, it is advisable to complete any painting which comes in contact with material, as sealant used at junctions is non-paintable.
- I. Panels should be stored flat and be pre-conditioned a minimum of 24 hours in ambient temperatures similar to the prevailing operational conditions.
- J. The panels must be stored on a level flat surface off the ground. Storage on uneven surfaces could cause the panels to distort prior to installation.
- K. Check the room, using a 6' (2 m) level, to ensure all walls are flat, paying particular attention to the corners, window reveals, and door entrances. These need to be inspected to ensure they are free of any debris or irregularities that could prevent the panels from lying flat to the substrate after the adhesive has been applied and the panel installed.

3.5 INSTALLATION

- A. Locate the Hygienic Wall Cladding as indicated on the approved detail drawing for the appropriate substrate and in compliance with the installation instructions. Install level and plumb at the height indicated on the drawings.
- B. Installation of Hygienic Wall Cladding

1. Adhere to substrate with Titebond GREENchoice Fast Grab FRP Construction, a freeze-thaw stable, nonflammable, high strength, water based adhesive that trowels on and allows approximately 20 minutes working time before firming.

3.6 CLEANING

- A. At completion of the installation, clean surfaces in accordance with clean-up and maintenance instructions.

3.7 PROTECTION

- A. Do not install near open heat sources (ovens, etc.). Stainless steel panels should be used in such areas.

END OF SECTION

SECTION 097700 FIBERGLASS REINFORCED PANELS

Section Revised DSI0004, 27 AUG 2021

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fiber reinforced laminate panels (FRL-1).

1.2 COORDINATION

- A. Coordinate layout and installation of fiber glass-reinforced panels and attachment system components with other construction, including partition assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of fiberglass-reinforced panel indicated, include installation instructions, construction details, weights, individual components, profiles and finishes.
- B. Samples: Two 8 inch by 10 inch samples of each type of panel, 10 inch length of each type of trim and molding, fastener.
- C. Shop Drawings: Indicate and dimension locations of joints, fastener attachments.
 - 1. Show fabrication and installation details not shown on product data.
 - 2. Show profiles, thicknesses, joints, tolerances and anchorage details.
 - 3. Show connections to wall mounted items: cutouts for grilles.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Manual.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed fiber glass-reinforced panel installations similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials:
 - 1. Package sheets on skids or pallets for shipment to project site.
 - 2. Deliver adhesive in sealed containers with labels legible and intact.
- B. Storage of Materials:
 - 1. Store sheets in dry place at project site for at least 48 hours prior to installation.
- C. Handling:
 - 1. When moving more than single sheet, place sheets face-to-face and back-to-back.
 - 2. Protect surface during cutting and working by application of temporary, strippable coating or by other means recommended by panel manufacturer.
 - 3. Remove foreign matter from face of panel by use of soft bristle brush, avoiding abrasive action.

1.7 PROJECT CONDITIONS

- A. During installation and for not less than 48 hours before, maintain ambient temperature and relative humidity within limits required by type of adhesive used.

- B. Allow no containers of adhesive to be opened until potential sources of flame or spark have been shut down or extinguished and until warnings against their ignition during adhesive application have been posted.
- C. Provide ventilation to disperse fumes during application of solvent-based adhesive.
- D. Field Measurements: Where fiber glass-reinforced panels are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test Response Characteristics: Provide fiber glass-reinforced panels with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL or another independent testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.

2.2 FIBER REINFORCED LAMINATE PANELS

- A. Manufacturer: Panolam Industries International, Inc.
- B. Fiber reinforced laminate panels (FRL-1)
 - 1. Thickness: 0.075 inches Also available in a sanded back for door applications only (0.062 inches).
 - 2. Color and Finish: As selected by architect from manufacturer's full range of Nevamar or Pionite colors and designs.
 - 3. Surface Burning Characteristics: US Standard UL-723/ASTM E 84 Class A.
 - 4. Chemical resistant compliant with SEFA 8 requirements.
 - 5. Wear Resistance (Cycles) NEMA 3.13: 3500 typical.
 - 6. Flexural Strength ASTM D790: 20,148 psi typical.
 - 7. Molding Profiles: Outside corners flat, outside corners round, division bars, inside corners,
 - 8. standard end caps.
 - 9. Adhesive: Construction Adhesive #4319 by Franklin Adhesives and Polymers or equal approved by panel manufacturer.
 - 10. Joint Sealant: Color Sil by Color Rite or equal approved by panel manufacturer; 100 percent silicone based colored sealant.

2.3 INSTALLATION ACCESSORIES

- A. Adhesives and Sealants Composition and VOC Limits: In compliance with applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168.
- A. Adhesive: As recommended by panel manufacturer for application to substrate.
 - 1. VOC Content: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Sealant: Single-component, mildew-resistant silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079000 - Joint Protection.
 - 1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Exposed Fasteners: Non-corrosive nylon drive rivets as recommended by panel manufacturer.

- D. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

PART 3 EXECUTION

3.1 INSTALLATION

- B. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected.
- A. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- C. Install fiberglass-reinforced paneling according to manufacturer's written instructions.
- D. Install panels in a full spread of adhesive.
 - 1. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
 - 2. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.
 - 3. Install trim with adhesive.
- E. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.
 - 1. Drill oversized fastener holes in panels and center fasteners in holes.
 - 2. Apply sealant to fastener holes before installing fasteners.
 - 3. Apply trim with fasteners.
- F. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.
- G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

END OF SECTION

SECTION 09 90 00 PAINTING

Section Revised DSI0004, 27 AUG 2021

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Painting and finishing of new and existing materials (PT)
 - 2. Preparation of surfaces for painting and finishing.
 - 3. Repainting and refinishing of existing surfaces as indicated. Preparation of existing surfaces for repainting and refinishing.
 - 4. Wall-identification signs for fire and smoke assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each paint system specified, all coats, including block fillers and primers.
 - 1. Submit Manufacturer's certifications that products comply with specified requirements and with local regulations for VOC content.
- B. Samples: Submit three 4 inch by 6 inch samples of each specified finish to be reviewed for color and sheen. Architect reserves right to select color or finish from any manufacturer, herein specified, as necessary to achieve desired color or finish.
- C. Product Schedule: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations and cross-reference each material by manufacturer's catalog number and general classification.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Materials (Attic Stock): Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
 - 1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:
 - a. Interior, Paint: **3 gal.** of each color applied.
 - b. Exterior, Paint: **3 gal.** of each color applied.

1.4 QUALITY ASSURANCE

- A. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- B. Applicator Qualifications: Engage experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with record of successful in-service performance.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver paint materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, color designation and instructions for mixing or reducing.
- B. Provide adequate storage facilities. Store paint materials at minimum ambient temperature of 45 degrees F in well ventilated area. Restrict storage to paint materials and related equipment.
- C. Take precautionary measures to prevent fire hazards and spontaneous combustion. Comply with health and fire regulations.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements: Comply with manufacturer's recommendations as to environmental conditions under which painting and finishing can be applied. Do not apply finish in areas where dust is being generated.
- B. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Interior Wood: 15 percent.
- C. Ensure surface temperature and surrounding air temperature is above 40 degrees F before applying finishes. Minimum application temperature for latex paints for interior work shall be 45 degrees F and 50 degrees F for exterior work. Minimum application temperature for transparent finish shall be 65 degrees F, or surface and air temperature shall be 5 degrees above dew point.
- D. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes.
- E. Provide minimum 25 foot candles of lighting on surfaces to be finished.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Manufacturers:
 - 1. Sherwin-Williams Company
 - 2. Benjamin Moore & Co.
 - 3. ICI Paints
 - 4. PPG Industries
 - 5. Diamond Vogel Paints.
- B. Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- C. Single-Source Responsibility: Provide primers and undercoat coating produced by same manufacturer as finish coats.
- D. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- E. Field-Applied Interior Paints & Coatings: In compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or v1.2-2017, meeting applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
- F. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Dry-Fog Coatings: 400 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
 - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Floor Coatings: 100 g/L.
 - 9. Shellacs, Clear: 730 g/L.
 - 10. Shellacs, Pigmented: 550 g/L.
- G. Painting and Finishing Schedules: Refer to Painting and Finishing Schedules in Part 3 of this Section.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
2. Sheen: When one of following terms is used to denote specific sheen for coating listed, following index shall apply:
 - a. Flat: Less than 15 units based on 85 degrees of sheen.
 - b. Eggshell: 5 to 20 units based on 60 degrees of sheen.
 - c. Satin/Low Lustre: 15 to 35 units based on 60 degrees of sheen.
 - d. Semi-gloss: 30 to 65 units based on 60 degrees of sheen.
 - e. Gloss: Above 65 units based on 60 degrees of sheen.
- H. (PT), (PTE), (PTU) Paint Colors: Provide specified color in paint type as scheduled in this Section
 1. Refer to Material Identification List for color selections.
 2. Mixing and Tinting: Deliver paints ready-mixed to job site. Job mixing and job tinting is not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive paint and transparent finishes for conditions that would adversely affect execution, permanence or quality of work and which cannot be put into acceptable condition through preparatory work. Do not proceed with surface preparation or coating application until conditions are suitable.

3.2 PREPARATION OF SURFACES

- A. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as specified, for each particular substrate condition.
 1. Remove mildew, by scrubbing with solution of detergent, bleach and warm water. Rinse with clean water and allow surface to dry completely.
 2. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of anticipated problems in using specified coating systems with substrate primed by others.
- B. Remove hardware, hardware accessories, plates, lighting fixtures, and similar items in-place and not to be finish painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items by workmen skilled in trades involved.
- C. Clean surfaces to be painted before applying paint or surface treatment. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program cleaning and painting so that dust and other contaminants from cleaning process will not fall in wet, newly painted surfaces.
 1. Remove dirt, grease and oil from canvas and cotton insulated coverings.
- D. Gypsum Wallboard: Remove contamination from gypsum wallboard surfaces and prime to show defects, if any. Paint after defects have been remedied.
- E. Galvanized Surfaces: Clean free of oil and surface contaminates with acceptable non-petroleum based solvent.
- F. Ferrous Metals: Clean non-galvanized, ferrous surfaces that have not been shop-coated of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning, complying with Steel Structures Painting Council (SSPC)-SP3.
 1. Touch-up shop-applied prime coats which have damaged or bare areas. Wire-brush, solvent-clean, and touch-up with same primer as shop coat.

2. Clean unprimed steel surfaces by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Prime surfaces to indicate defects, if any. Paint after defects have been remedied.
 3. Sand and scrape shop primed steel surfaces to remove loose primer and rust. Feather out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime steel including shop primed steels.
- G. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view and dust off.
1. Prime or seal wood required to be job painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood.
 2. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
- H. Existing Surfaces to be Repainted or Refinished: Wash surfaces to remove grease, oil, soil or other matter which will interfere with proper bond of new materials. Scrape and wire brush loose or flaking paint. Fill cracks, voids or other defects.

3.3 MATERIALS PREPARATION

- A. Mix and prepare painting materials and transparent finish materials in accordance with manufacturer's directions.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce mixture of uniform density, and as required during application of materials. Do not stir any film that may form on surface into material. Remove film and, if necessary, strain material before using.

3.4 APPLICATION

- A. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
 4. Apply each coat at proper consistency.
 5. Each coat of paint shall be slightly darker than preceding coat unless otherwise approved by Architect.
 6. Provide finish coats which are compatible with prime paints used.
- B. Do not apply succeeding coats until previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper, or rub surfaces with pumice stone where required to produce even, smooth surface in accordance with coating manufacturer's directions.
 1. Allow each coat of finish to dry before following coat is applied, unless directed otherwise by manufacturer.
- C. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive film thickness equivalent to that of flat surfaces.
- D. Finish doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.
- E. Film Thickness: Apply materials in accordance to paint manufacturer's recommendations and spreading rates to provide total dry film thickness as recommended.
 1. Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated

2. Use precision instruments designed for measuring and evaluation wet and dry films of paints and coatings.
 3. Results measuring less than recommended thickness will require additional material application.
 4. Use of poor hiding colors may require application of additional coats in order to achieve proper coverage and hiding.
- F. Apply first-coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - G. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of undercoat.
 - H. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure finish coat with no burn-through or other defects due to insufficient sealing.
 - I. Transparent Finish: On exposed portions, use multiple coats to produce glass-smooth surface film continuity of even luster. Provide finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.
 - J. Painting and Repainting of Existing Surfaces: Where repainting of existing surfaces is required, repaint wall and ceiling surfaces in their entirety, patch or spot painting is not acceptable.
 - K. Paint surfaces behind movable equipment or furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only.
 - L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to mechanical and electrical documents with respect to field painting and finishing requirements. Painting of mechanical and electrical work is not required in pipe chases, tunnels, and mechanical rooms with unpainted walls.
- B. Remove grilles, covers and access panels for mechanical and electrical systems from location and paint separately.
- C. Finish paint primed equipment to color selected.
- D. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with prefinished coating, or where they are not in finished space or room.
- E. Paint interior surfaces of air ducts, convactor and baseboard heating cabinets that are visible through grilles and louvers before installation of equipment with 1 coat of flat black paint, to limit of sight line. Paint dampers exposed immediately behind louvers, grilles, convactor and baseboard cabinets to match face panels.
- F. Paint exposed piping, insulated piping and conduit occurring in finished areas. Color and texture to match adjacent surfaces.
- G. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.

3.6 CLEANING

- A. As work proceeds and upon completion, promptly remove paint where spilled, splashed or spattered. Touch up and restore damaged or defaced painted areas.
- B. During progress of work keep premises free from unnecessary accumulation of tools, equipment, surplus materials and debris. Remove at end of each workday.

- C. Upon completion of work clean window glass and other paint-spattered surfaces and leave premises neat and clean, to satisfaction of Architect.

3.7 PROTECTION

- A. Adequately cover or otherwise protect finished work of other trades and other surfaces from paint and damage. Repair damage as result of inadequate or unsuitable protection as acceptable to Architect.
 - 1. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.
- B. Place cotton waste, cloths and material which may constitute fire hazard in closed metal containers and remove daily from site.
- C. Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations. These items shall be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.
- D. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.8 INTERIOR PAINTING AND FINISHING SCHEDULE

- A. Ferrous and Non-Ferrous Metal Surfaces: Zero-VOC, Low-Odor Acrylic over Waterborne Metal Primer; not less than 35 percent solids, ammonia free coating.
 - 1. VOC Requirement: Not more than 50 grams VOC's per liter,
 - 2. Primer: 1 coat S-W DTM Acrylic Primer, B66W1.
 - 3. Finish:
 - a. 2 coats S-W ProMar 200 Zero-VOC Interior Latex Semi-Gloss, B31-2600 Series.
 - b. 2 coats S-W Zero-VOC Acrylic Gloss, B66-600 Series.
- A. Gypsum Wallboard, Gypsum Plaster and Gypsum Veneer Plaster Surfaces:
 - 1. Surfaces Included:
 - a. Gypsum wallboard, including over skim coat of joint compound.
 - b. Apply additional coat of primer under deep tone finish paint.
 - c. Veneer plaster.
 - 2. Sheens, General: Unless noted otherwise on Room Finish Schedule.
 - a. Walls: Eggshell
 - b. Ceilings and Soffits: Flat
 - c. Walls where indicated on Room Finish Schedule: Semi-gloss.
 - 3. Waterborne Zero-VOC, Low-Odor System: Zero-VOC, Low-Odor Acrylic Finish over Zero-VOC, Low-Odor Acrylic Primer - not more than 50 grams VOCs per liter, not less than 35 percent solids, ammonia free coating.
 - a. Primer: 1 coat S-W ProMar 200 Zero-VOC Interior Latex Primer, B28W2600 Series.
 - b. Finish:
 - 1) 2 coats S-W ProMar 200 Zero-VOC Interior Latex Flat, B30-2600 Series.
 - 1) 2 coats S-W ProMar 200 Zero-VOC Interior Latex Eg-Shel, B20-2600 Series.
 - 2) 2 coats S-W ProMar 200 Zero-VOC Interior Latex Semi-Gloss, B31-2600 Series.
 - 4. (PTE) Waterborne Epoxy System, High Traffic Areas: Waterborne Polyamide Gloss Epoxy Finish over Acrylic Primer/Sealer.
 - a. Primer: 1 coat S-W Acrylic Primer/Sealer.
 - b. Finish: 2 coats S-W Zero-VOC Waterbased Catalyzed Epoxy, B73 Series.
 - 5. Waterborne Low VOC, Low Odor System: (Low VOC, Low Odor Acrylic Finish over Low VOC, Low Odor Acrylic Primer - not more than 50 grams VOCs per liter, not less than 35 percent solids, ammonia free coating)
 - a. Primer: 1 coat S-W ProGreen 200 Latex Primer, B28W600.

- b. Finish: (choose sheen)
 - 1) 2 coats S-W ProGreen 200 Latex Flat, B30-600 Series.
 - 2) 2 coats S-W ProGreen 200 Latex Eg-Shel, B20-600 Series.

B. Wood Surfaces for Painted Finish:

- 1. Surfaces Included:
 - a. Wood doors and frames, except where pre-finish is indicated.
 - b. Other wood for paint finish.
 - c. Concealed surfaces of wood items to be back-primed.
- 2. Waterborne Zero-VOC, Low-Odor System: Zero-VOC, Low-Odor Acrylic Finish over Acrylic Latex Wood Primer - not more than 50 grams VOC's per liter, not less than 35 percent solids, ammonia free coating.
 - a. Primer: 1 coat S-W Premium Wood Primer, B28W8111.
 - b. Finish: 2 coats S-W ProMar 200 Zero-VOC Interior Latex Eg-Shel, B20-2600 Series.

C. Non-Metal Ceilings and Soffits:

- 1. Surfaces Included:
 - a. Gypsum board assemblies.
 - b. Plaster assemblies.
 - c. Spray fireproofing (SFRM)
 - d. Acoustical tile ceilings.
- 2. Dry Fall Spray-Applied Waterborne System: Waterborne Dryfall over Waterborne Metal Primer.
 - a. Primer (touch up if pre-primed): 1 coat S-W Pro-Cryl Universal Primer, B66-310 Series.
 - b. Finish: 1 coat S-W Waterborne Acrylic Dry Fall, B42W2.

3.9 SPECIAL SURFACES

D. Insulation-Wrapped Piping and Equipment:

- 1. Surfaces Included: Piping, ducts, tanks, and equipment.
- 2. Waterborne System: Premium Quality Acrylic Latex finish over -Acrylic Primer.
 - a. Primer: 1 coat S-W Moisture Vapor Barrier Primer, B72W1.
 - b. Finish: 2 coats S-W ProMar 200 Zero-VOC Interior Latex Eg-Shel, B20-2600 Series.

E. Black Enamel Finish:

- 1. Surfaces Included: Duct throats for visible distance but not less than approximately 24 inches behind supply or return air grilles, registers, louvers.
 - a. Wood blocking exposed at reveals.
- 2. Water-Based Systems, Low-VOC: Acrylic Latex Finish.
 - a. Finish: 1 coat S-W ProMar 400 Latex Flat Black, B30W400 Series.

3.10 REPAINTING OF EXISTING SURFACES

A. Existing Surfaces:

- 1. Surfaces Included:
 - a. Existing surfaces where indicated to be repainted.
 - b. Existing metal lockers (casework) (metal toilet compartments) where indicated to be repainted.
- 2. Low-VOC Latex System:
 - a. Primer/Finish: 2 coats paint similar to type listed above.
- 3. Electrostatic System:
 - a. Primer/Finish: 2 coats electrostatic paint finish.

3.11 SMOKE AND FIRE PARTITIONS

- A. Stenciling: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions to be stenciled with the appropriate Hour-rating/Minute rating, i.e., "SMOKE and/or FIRE (1 HR /2 HR) – Protect All Openings," etc. as indicated on the Life Safety Plan, above ceilings on both sides of walls in letters not less than 3 inches high and 3/8 inch wide stroke. Refer to IBC Article 703 for additional information.
1. Stenciling shall be located above every door and no more than fifteen feet on center.
 2. Stencil every change in direction of rated walls.
 3. Indicate the end of a rated wall with a 2-inch vertical red line with an arrow pointing to the direction of the rated wall.
- B. Lead Walls: Stencil above the ceiling, both sides of walls lined with lead with the height of the lead and the density, i.e., "7 FOOT A.F.F./4 LB. LEAD".
- C. MRI RF Shielded Walls: Stencil above ceilings, both sides of walls: "RF Shielded Wall".
- D. Latex Primer/Finish System: Provide red semi-gloss paint. S-W 0 VOC Acrylic Semi-Gloss, B66-650 Series.

3.12 MARKING FIRE AND SMOKE ASSEMBLIES

- F. Wall-Identification Sign: Sign applied directly on indicated substrate to identify fire and smoke assemblies, including preparatory treatment as required.
1. Sign Material: Stenciled-on [alkyd] [latex] [or] [VOC-compliant spray-applied] paint or preprinted, self-adhesive decals.
 1. Font: Minimum **3 inches** high characters in a contrasting color, with minimum **0.375-inch** wide strokes.
 2. Text:
 - a. "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS."
 - b. "1-HOUR FIRE BARRIER - PROTECT ALL OPENINGS."
 - c. "2-HOUR FIRE BARRIER - PROTECT ALL OPENINGS."
 - d. "SMOKE BARRIER - PROTECT ALL OPENINGS."
- G. Wall-Identification Signs: Permanently identify both sides of each fire and smoke assembly indicated on Drawings. Place signs in accessible, concealed floor, floor-ceiling, or attic space at maximum **15 feet** from end of wall and at maximum intervals of **30 feet**, measured horizontally along the assembly. Locate signs for greatest visibility in the space.

3.13 PIPE PAINTING

- A. Surfaces Include: All exposed pipe surfaces.
- B. System:
- C. Painting Colors: Matching Sherwin Williams colors listed below
1. High and Low Pressure Steam: Safety Yellow
 2. High and Low Pressure Condensate Return Line and Tank: Brass
 3. High and Low Pressure Boiler Feed Water: Mill Ivory
 4. High and Low Pressure Exhaust Breaching: Silver
 5. Vacuum: Pure White
 6. Oxygen: Rain Forest
 7. Medical Air: Modelar Tan
 8. Lab Air: Pallet Tan
 9. Nitrous Oxide: Blue Print
 10. 20 lb. Air for Pneumatic controlled Equipment and 80 lb., Air for Pneumatic Controlled Equipment, and Compressed Air: Turbine Blue.
 11. Nitrogen: Graphite
 12. Gas: Safety Orange
 13. Oil: Black
 14. Domestic Water: Circuit Breaker
 15. 120 Degree Hot Soft Water: Polymer Blue

16. Soft water and Polished Soft Water: Hydro Blue
17. Non Potable Water: Toggle Teal
18. Chilled Water Closed Loop & Pumps: Safety Blue.
19. Condenser Water & Pumps: Dewpoint
20. Radiation Closed Loop & Pump: Solar Yellow
21. Reheat Closed Loop & Pump: Junction Yellow
22. Fire Sprinkler Lines: Safety Red
23. A.C. Freon Lines: Plumb
24. Electrical Conduits: Structural Grey.

END OF SECTION

SECTION 10 21 23 HOSPITAL TRACKS & CUBICLE CURTAINS

Section Revised DSI0004, 27 AUG 2021

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Overhead metal curtain track and rollers, accessories and anchorages (HT-1).
 - 2. Fabric curtains and mesh cloth (CC-1).
 - 3. Accessories and anchorage.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product specified.
- B. Shop Drawings:
 - 1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
 - 2. Include details on blocking.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches in size.
 - 1. Track: Submit 12 inch length of curtain track including wall and ceiling hanger and escutcheon.
 - 2. Curtain: Submit 12 inch by 12 inch sample patch of curtain cloth with representative hem stitch detail, heading with reinforcement, carrier attachment to curtain header.

1.3 CLOSEOUT SUBMITTAL

- A. Operation and Maintenance Data: For curtains, track, and hardware to include in operation and maintenance manuals.
- B. Maintenance Materials (Attic Stock): Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Curtain Carriers and Track End Caps: Full-size units equal to 3 percent of amount installed for each size indicated, but no fewer than 10 units.
 - 2. Curtains: Full-size units equal to 10 percent of amount installed for each size indicated, but no fewer than [two] units.

PART 2 PRODUCTS

2.1 HOSPITAL TRACKS

- A. Extruded-Aluminum Curtain Track: Not less than 1-1/4 inches wide by 3/4 inch with manufacturer's standard wall thickness.
 - 1. Curved Track: Factory-fabricated, 12-inch radius bends.
 - 2. Finish: Baked enamel, acrylic, or epoxy.
- B. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
 - 1. Suspended-Track Support: Not less than 7/8-inch- OD tube.
 - 2. End Stop: Removable with carrier hook.
- C. Curtain Carriers: Two nylon rollers and nylon axle with **chrome-plated steel** hook.
- D. Exposed Fasteners: Stainless steel.

- E. Concealed Fasteners: [Hot-dip galvanized] [Stainless steel].

2.2 CUBICAL CURTAINS

- A. Curtains: Provide curtain fabrics with the following characteristics:
 - 1. Launderable to a temperature of not less than 160 deg F.
 - 2. Flame resistant and identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Identify fabrics with appropriate markings of a qualified testing agency.
- B. (CC) Cubicle Curtains:
 - 1. Basis of Design: As indicated on Material Identification List.
 - 2. Polyester, 100 percent inherently flame retardant passing NFPA 701.
 - 3. Provide seamless one-piece curtains, sized 10 percent wider than length of track but no less than 1 foot extra length.
 - 4. Open mesh cloth weave, flameproof material, washable and dry-cleanable.
- C. Curtain Fabrication:
 - 1. Manufacture curtains of one piece sized to 10 percent minimum wider than track length. Extend curtain to 15 inches from floor.
 - 2. Curtain heading of triple thickness 2 inch wide, with rustproof rolled edge metal grommet button holes for carriers at 6 inches on center; bottom hem 2 inches wide. Lockstitch in 2 row seams. Turn edges.
- D. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.
- E. Mesh Top: Not less than 20-inch-high mesh top of No. 40 nylon mesh.
- F. Beaded-Chain Curtain Drop: 12 inches long; nickel-plated steel with aluminum hook.
- G. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install curtain track secure and rigid, true to ceiling line. Provide track to support vertical test load of 50 lbs without visible deflection of track or damage to supports. Do not suspend track from suspended ceiling system.
- B. Install curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 10 26 00 WALL & DOOR PROTECTION

Section Revised DSI0004, 27 AUG 2021

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall guards (WGS).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
- C. Samples: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified. Include Samples of accent strips and accessories to verify color selection.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver wall and corner guards in manufacturer's protective covering. Handle finished surfaces with care to prevent damage.

PART 2 PRODUCTS

2.1 PETG PRODUCTS

- A. Manufacturers Products:
 - 1. InPro Corporation.
 - 2. Tepromark International Inc..
 - 3. Construction Specialties (C/S Group).
 - 4. Pawling Corporation, Standard Products Division.
 - 5. Korogard Wall Protection Systems.
 - 6. Institutional Products Corporation, IPC.
- B. PETG Material: Textured, chemical and stain resistant, high-impact, thickness as indicated.
 - 1. Fire performance characteristics when tested in accordance with ASTM E84 for Class A/1 characteristics listed below:
 - a. Flame spread: 25 or less.
 - b. Smoke development: 450 or less.
- C. Basis of Design: As indicated on Material Identification List.
- D. (WGS) Wall Guard:
 - 1. Size: As indicated on Drawings.

2.2 ACCESSORIES

- A. Attachment Hardware: As recommended by manufacturer for wall construction type.
- B. Aluminum Retainers: Extruded 6063-T6 alloy aluminum retainers. Minimum strength and durability properties complying with ASTM B221.
- C. Trim and Accessories: Edge and corner trim as required for a complete finished installation as approved by Architect.

2.3 INSTALLATION ACCESSORIES

- A. Fasteners: Non-corrosive and compatible with aluminum retainers, supplied by wall protection manufacturer.
- B. Adhesives: As recommended by signage manufacturer for use with material being adhered to substrate indicated and as follows:
 - 1. Adhesive and Sealant VOC Limits: In accordance with South Coast Air Quality Management District Rule 1168 and GS-36 for aerosols.
 - 2. VOC Limits: As tested using U.S. EPA Reference Test Method 24 and as defined by South Coast Air Quality Management District Rules SCAQMD Rule 1168, Adhesive and Sealant Applications.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Examination: Examine areas and conditions in which wall surface protection components and wall protection systems will be installed. Do not proceed with installations until unsatisfactory conditions have been corrected.
- B. Installation: Install wall protection and corner guards and accessories in accordance with reviewed shop drawings and manufacturer's printed instructions. Install true, plumb and level, securely and rigidly anchored to substrate.
- C. Cleaning: Clean metal components in accordance with manufacturer's recommendations. Remove excess adhesive using methods and materials recommended by manufacturer.

END OF SECTION

SECTION 10 28 13 TOILET & BUILDING ACCESSORIES

Section Revised DSI0004, 27 AUG 2021

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Washroom accessories.
 - 2. Shower accessories.

1.2 COORDINATION

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples:
 - 1. Finish Samples: Submit samples of each exposed finish type.
 - 2. Unit Samples: Full size, for each accessory item to verify design, operation, and finish requirements. Approved full-size Samples will be returned and may be used in the Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver accessories to site until rooms in which they are to be installed are ready to receive them.
- B. Pack accessories individually in manner to protect accessory and its finish.

1.7 WARRANTY

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

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specified Basis of Design products.
 - 1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.
 - 2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- B. Names and labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- C. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Products and Manufacturers: Subject to compliance with specified requirements, provide Basis of Design products as indicated in Product Schedule, or approved equivalent products by one of the following manufacturers:
 - 1. Washroom Equipment:
 - a. Bobrick Washroom Equipment Inc.
 - b. American Specialties Inc.
 - c. Bradley Corporation
 - d. GAMCO
 - e. Tork

2.2 SCHEDULE OF CUSTODIAL AND TOILET ACCESSORIES

- A. Schedule: Subject to compliance with specified requirements, provide Basis of Design products as indicated on Material Identification List or equivalent products, as approved by Architect.

2.3 GENERAL ACCESSORIES

- A. Coat Hooks:
 - 1. (CH-1) Single Hook: Stainless steel, satin finish.
 - 2. (CH-2) Double Hook: Stainless steel, satin finish.

2.4 WASHROOM ACCESSORIES

- A. (GB) Grab Bars: In accordance with requirements of 2010 ADA Standards and CBC 11B, capable of withstanding load of 250 lbf applied in any direction and at any point on the grab bar, fastener, mounting device or supporting device; in accordance with ASTM F 446.
 - 1. Material and Finish: Type 304 stainless steel pipe, 18 ga., 1-1/2" outer diameter, with satin finish on ends and slip-resistant texture in grip area.
 - 2. Mounting: Flanges with concealed fasteners and gasketed stainless steel escutcheon.
 - 3. Configurations: As indicated on Drawings. Refer to grab bar schedule in Drawings.
- B. Mirrors:
 - 1. (MIR-1) Framed Mirror:
- C. Paper Towel Cabinets:
 - 1. (PTC-1) Paper Towel Dispensers: surface-mounted multifold
- D. Soap Dispensers:
 - 1. (SDISP-1) Soap Dispenser: Surface-mounted, stainless steel, horizontal design
 - 2. (SDISP-5) Soap Dispensers: Surface-mounted, vertical design.

- E. Sanitary Napkin Disposal Units:
 - 1. (SND-3) Sanitary Napkin Disposal Units: Surface-mounted.
- F. Toilet Paper Holders:
 - 1. (TPH-2) Toilet Paper Holders: Surface-mounted, double roll, 1 in reserve. stainless steel dispenser.
 - 2. (TPH-3) Toilet Paper Holders: Recessed, multi-roll..
- G. Toilet Seat Covers:
 - 1. (SCD-2) Toilet Seat Covers: surface-mounted.
- H. Utility Shelves:
 - 1. (US-1) Stainless Steel Shelf: surface-mounted.

2.5 SHOWER ACCESSORIES

- A. Shower Curtains and Rod (SHCR-1):
 - 1. Size: Minimum 12 inches wider than opening by 72 inches high.
 - 2. Material: Vinyl, minimum 0.006 inch thick, opaque, matte.
 - 3. Color: As selected from manufacturer's full range.
 - 4. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
 - 5. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
 - a. Shower Curtain Hooks: Bobrick 204-1.
 - 6. Shower Curtain Rod:
 - a. Description: **1-inch** OD; fabricated from nominal 1.0 mm thick stainless steel.
 - b. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
 - c. Finish: No. 4 (satin).
- B. Shower Folding Seats:
 - 1. (SHFS-1) Folding Shower Seat:
 - a. Configuration: Reversible L-shaped seat, designed for wheelchair access.
 - b. Seat: Phenolic or polymeric composite of one-piece construction; matte white color and finish.
 - c. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
 - 2. (SHFS-2) Folding Shower Seats: rectangular, hand as indicated, laminated phenolic slats, in color from Manufacturer's standards, with 1 inch o.d. stainless steel frame and mounting mechanism, and static load capacity of 250 pounds.
 - a. Seat Supports: Swing down legs of zinc-plated 3/4 inch (19mm) diameter steel pipe with 1/8 inch (3mm) thick white vinyl anti-bacterial, bio-compatible, and warm-to-the-touch coating.
- C. Towel Bars:
 - 1. (TB-1) Towel Bars: surface-mounted, 3/4-inch square bar, square mounting flange, stainless steel with bright polished finish.
 - 2. (TB-2) Towel Bars: heavy duty type.

2.6 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated..
- B. Galvanized Steel Sheet: ASTM A 653, G60.
- C. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- D. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.
- E. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
 - 1. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

- F. Fasteners and Mounting Devices: Provide concealed fasteners where possible.
 - 1. Where fasteners remain exposed to view, provide tamper-resistant and theft-resistant fasteners, of material and finish to match accessory unit.
 - 2. Screws, bolts, and other devices of same material as unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
 - 3. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication
- G. Fasteners, Screws, and Bolts: Hot dip galvanized.
- H. Expansion Shields: Fiber, lead or rubber as recommended by accessory manufacturer for component and substrate. Provide exposed fasteners with finish to match accessories.
- I. Adhesive: Epoxy type contact cement

2.7 FABRICATION

- A. General:
 - 1. Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
 - 2. Shop assemble components and package complete with anchors and fittings.
 - 3. Keys: Provide universal keys for internal access to accessories for servicing and resupplying.
- B. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- C. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- D. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- E. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
- F. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
- G. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- H. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 EXECUTION

3.1 PREPARATION

- A. Deliver inserts and rough-in frames to jobsite at appropriate time for building-in. Provide templates and rough-in measurements as required.
- B. Before starting work notify Architect in writing of conflicts detrimental to installation or operation of units.
- C. Verify exact location of accessories with Architect. Verify blocking is in place prior to gypsum board installation.

- D. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

3.2 INSTALLATION

- A. Install fixtures, accessories and items in accordance with manufacturer's printed instructions.
- B. Install true, plumb and level, securely and rigidly anchored to substrate and sealed to protect structural elements of wall from moisture.
- C. Use tamper proof (security) type fasteners.

3.3 INSTALLED WORK

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish exposed surfaces in accordance with manufacturer's recommendations after removing labels and protective coatings.

END OF SECTION

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Supports and anchorages.

1.3 BASIS-OF-DESIGN

- A. Equipment manufacturers listed on the equipment schedules are the basis-of-design. Manufactures listed in the specification other than the basis-of design manufacture are acceptable substitutions. Equipment schedules are on the drawings. Refer to specifications for unscheduled equipment.

1.4 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

1.5 SUBMITTALS

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

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Equipment Startup Reports.

1.7 QUALITY ASSURANCE

- A. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- B. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

- C. Equipment Substitutions: Equipment of greater capacity or of greater physical size or weight may be furnished provided such proposed equipment is approved in writing. Approval will require that any necessary structural modifications are made, any connecting mechanical and electrical services are increased, and if accommodations can be made in the allocated space. No additional costs will be approved for any changes necessary to provide the larger equipment. Refer to Division 1 Section "Product Options and Substitutions."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.9 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate plumbing equipment installation with other building components.
- E. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- F. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate connection of plumbing equipment and systems with building electrical systems.

1.10 GUIDELINES, CODES AND STANDARDS

- A. Refer to the most recently published edition for references to guidelines, and standards (examples: ASHRAE, NFPA, AWWA, ASTM) unless a specific edition is listed.
- B. Installation and materials shall comply with applicable national, state, and local codes and ordinances.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1. Manufacturers:
 - a. Epco Sales, Incorporated
 - b. Hart Industries, International, Incorporated
 - c. Watts Industries, Incorporated; Water Products Division
 - d. Zurn Industries, Incorporated; Wilkins Division
- D. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Perfection Corporation.
 - b. Precision Plumbing Products, Incorporated
 - c. Sioux Chief Manufacturing Company, Incorporated
 - d. Victaulic Company of America.

PART 3 EXECUTION

3.1 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.2 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in steel piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric nipple fittings to connect piping materials of dissimilar metals.

END OF SECTION

SECTION 22 05 18 ESCUTCHEONS FOR PLUMBING PIPING

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. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. BrassCraft Manufacturing Co.; a Masco Company (www.brasscraft.com)
 - 2. Dearborn Brass (www.oatey.com)
 - 3. Jones Stephens Corp. (www.jonesstephens.com)
 - 4. Keeney Manufacturing Company (The) (www.keeneymfg.com)
 - 5. Mid-America Fittings, Inc. (www.midamericafittings.com)
 - 6. ProFlo; a Ferguson Enterprises Inc. Brand (www.proflo.com)

2.2 ESCUTCHEONS

- A. One-Piece, Steel Type: With chrome-plated finish and setscrew fastener.
- B. One-Piece, Cast-Brass Type: With chrome-plated finish and setscrew fastener.
- C. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
- D. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
- E. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for exposed piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
 - b. Chrome-Plated Piping: One-piece cast brass or split-casting brass with chrome-plated finish.
 - c. Insulated Piping: One-piece steel with polished, chrome-plated finish.
 - d. Insulated Piping: One-piece cast brass with polished, chrome-plated finish.
 - e. Insulated Piping: Split-plate, stamped steel with concealed hinge chrome-plated finish.

- f. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
- g. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge.
- h. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
- i. Bare Piping in Unfinished Service Spaces: One-piece cast brass with polished, chrome-plated or rough-brass finish.
- j. Bare Piping in Equipment Rooms: One-piece cast brass with polished, chrome-plated finish.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons using new materials.

END OF SECTION

SECTION 22 05 23.12
BALL VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.
 - 1. Certification that products comply with NSF 61 Annex G.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.5 for flanges on steel valves.
 - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 5. ASME B16.18 for solder-joint connections.
 - 6. ASME B31.9 for building services piping valves.
- A. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.
- C. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- E. Valve Sizes: Same as upstream piping unless otherwise indicated.
- F. Valve Actuator Types:
 - 1. Handlever: For quarter-turn valves smaller than NPS 4.
- G. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

- A. Bronze Ball Valves, Three-Piece with Full Port and Bronze or Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. NIBCO Incorporated (www.nibco.com)
 - b. Milwaukee Valve Company. (www.milwaukeevalve.com)
 - c. Apollo Valves; Conbraco Industries, Inc. (www.apollovalves.com)
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Three piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded.
 - f. Seats: PTFE.
 - g. Stem: Bronze.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Division 22 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Bronze ball valves, three-piece with full port and bronze or brass trim.
- B. Pipe NPS 2-1/2 and Larger:
 - 1. Steel and Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Fastener systems.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 ACTION SUBMITTALS

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

1.5 QUALITY ASSURANCE

- B. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 PRODUCTS

2.0 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2.1 FASTENER SYSTEMS

- D. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.2 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.3 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-58 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- K. Insulated Piping:
 - 1. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used.
 - 2. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used.
 - 3. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

- d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
- 4. Pipes NPS 8 and Larger: Include reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

3.2 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.3 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel, pipe hangers and supports, metal trapeze pipe hangers, and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 5. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
 - 6. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 2. C-Clamps (MSS Type 23): For structural shapes.
 3. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 4. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND 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:
 - 1. Pipe labels.
 - 2. Stencils.
 - 3. Valve tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 PRODUCTS

2.1 EQUIPMENT LABELS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for equipment.
 - 1. Stencil Material: Fiberboard or metal.
 - 2. Stencil Paint: Exterior, gloss acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.
 - 4. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.2 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
 - 1. Brady Corporation (www.bradycorp.com)
 - 2. Emedco (www.emedco.com)
 - 3. LEM Products Inc. (www.lemproductsinc.com)
 - 4. Marking Services, Inc. (www.markserv.com)
 - 5. Seton Identification Products (www.seton.com)
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- C. Pretensioned Pipe Labels: Precoiled, semi rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.3 STENCILS

- A. Stencils for Piping:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
 - a. Brimar Industries, Inc. (www.pipemarker.com)
 - b. Champion America (www.champion-america.com)
 - c. Craftmark Pipe Markers (www.craftmarkid.com)
 - d. Marking Services, Inc. (www.markserv.com)
 - 1. Lettering Size: Size letters according to ASME A13.1 for piping, at least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
 - 2. Stencil Material: Aluminum
 - 3. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 4. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.4 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
 - 1. Brady Corporation (www.bradycorp.com)
 - 2. Emedco (www.emedco.com)
 - 3. LEM Products Inc. (www.lemproductsinc.com)
 - 4. Marking Services, Inc. (www.markserv.com)
 - 5. Seton Identification Products (www.seton.com)
- B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass beaded chain; or S-hook.
- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 PIPE LABEL INSTALLATION

- A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- 1. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- C. Pipe Label Color Schedule:
 - 1. Domestic Water Piping:
 - a. Background Color: Safety Green.
 - b. Letter Color: White.
 - 2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Safety Green.
 - b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches round.
 - b. Hot Water: 1-1/2 inches round.
 - 2. Valve-Tag Color:
 - a. Cold Water: Natural.
 - b. Hot Water: Natural.
 - 3. Letter Color:
 - a. Cold Water: White.
 - b. Hot Water: White.

END OF SECTION

SECTION 22 07 19 PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Domestic recirculating hot-water piping.
 - 3. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Related Sections:
 - 1. Division 22 "Plumbing Equipment Insulation."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; a Berkshire Hathaway Company (www.jm.com)
 - b. Knauf Insulation (www.knaufinsulation.us)
 - c. Manson Insulation Inc. (www.imanson.com)
 - d. Owens Corning (www.owenscorning.com)
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H.B. Fuller Construction Products (www.fosterproducts.com)
 - b. Eagle Bridges – Marathon Industries (www.eaglebridges.com)
 - c. Mon-Eco Industries, Inc. (www.mon-ecoindustries.com)
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H.B. Fuller Construction Products (www.fosterproducts.com)
 - b. Eagle Bridges – Marathon Industries (www.eaglebridges.com)
 - c. Foster Brand; H.B. Fuller Construction Products (www.fosterproducts.com)
 - d. Mon-Eco Industries, Inc. (www.mon-ecoindustries.com)
- D. PVC Jacket Adhesive: Compatible with PVC jacket.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation (www.dowcorning.com)
 - b. Johns Manville; a Berkshire Hathaway Company (www.jm.com)
 - c. P.I.C. Plastics, Inc. (www.pic-plastics.com)
 - d. Speedline Corporation (www.speedline.com)

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand; H.B. Fuller Construction Products (www.fosterproducts.com)
 - b. Knauf Insulation (www.knaufinsulation.com)
 - c. Vimasco Corporation (www.vimasco.com)
 - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

2.4 SEALANTS

A. Joint Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H.B. Fuller Construction Products (www.fosterproducts.com)
 - b. Eagle Bridges – Marathon Industries (www.eaglebridges.com)
 - c. Foster Brand; H.B. Fuller Construction Products (www.fosterproducts.com)
 - d. Mon-Eco Industries, Inc. (www.mon-ecoindustries.com)
 - e. Pittsburgh Corning Corporation (www.foamglas.com)
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; a Berkshire Hathaway Company (www.jm.com)
 - b. P.I.C. Plastics, Inc. (www.pic-plastics.com)
 - c. Proto Corporation (www.protocorporation.com)
 - d. Speedline Corporation (www.speedlinepvc.com)
2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division (www.averydennison.com)
 - b. Compac Corporation (www.compaccorp.com)
 - c. Ideal Tape Co., Inc. an American Biltrite Company (www.idealtape.com)
 - d. Kanuf Insulation (www.knaufinsulation.com)
 - e. Venture Tape (www.venturetape.com)
2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.8 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Plumberex Specialty Products, Inc. (www.plumberex.com)
 - b. Truebro (www.truebro.com)
 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Testing agency labels and stamps.
 2. Nameplates and data plates.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Division 07 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

- A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot, Recirculated Hot Water, and Tepid:
1. NPS 1-1/2 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber Pipe Insulation, Type I: 1 1/2 inch thick.
 2. NPS 2 and Larger: Insulation shall be the following:
 - a. Mineral-Fiber Pipe Insulation, Type I: 2 inch thick.

3.10 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
1. Piping located within 8 feet of the floor; less than 200 degrees F: PVC: 30 mils thick.

END OF SECTION

SECTION 22 11 16 DOMESTIC WATER PIPING

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. Aboveground domestic water pipes, tubes, and fittings inside buildings.

1.3 ACTION SUBMITTALS

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

PART 2 PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- E. Copper-Tube, Extruded-Tee Connections:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. T-DRILL Industries, Inc. (www.t-drill.com)
 - 2. Description: Tee formed in copper tube according to ASTM F 2014.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. HART Industrial Unions, LLC (www.hartindustries.com)
 - b. Matco-Norca (www.matco-norca.com)
 - c. Watts; a Watts Water Technologies Company (www.watts.com)
 - d. Wilkins (www.zurn.com)
 - e. Zurn Industries, LLC (www.zurn.com)
 - 2. Standard: ASSE 1079.
 - 3. Pressure Rating: [150 psig minimum at 180 deg F].
 - 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Matco-Norca (www.matco-norca.com)
 - b. Watts; a Watts Water Technologies Company (www.watts.com)
 - c. Wilkins (www.zurn.com)
 - d. Zurn Industries, LLC (www.zurn.com)
 - 2. Standard: ASSE 1079.
 - 3. Factory-fabricated, bolted, companion-flange assembly.
 - 4. Pressure Rating: [150 psig minimum at 180 deg F]
 - 5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc. (www.apsonline.com)
 - b. Calpico, Inc. (www.calpiconinc.com)
 - c. Central Plastics Company (www.centralplastics.com)
 - d. Pipeline Seal and Insulator, Inc. (www.gptindustries.com)
 - 2. Non-conducting materials for field assembly of companion flanges.
 - 3. Pressure Rating: 150 psig.
 - 4. Gasket: Neoprene or Phenolic.
 - 5. Bolt Sleeves: Phenolic or polyethylene.
 - 6. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Grinnell Mechanical Products (www.grinnell.com)
 - b. Matco-Norca (www.matco-norca.com)
 - c. Precision Plumbing Products (www.pppinc.net)
 - d. Victaulic Company (www.victaulic.com)
 - 2. Standard: IAPMO PS 66.
 - 3. Electroplated steel nipple complying with ASTM F 1545.
 - 4. Pressure Rating and Temperature: 300 psig at 225 deg F.
 - 5. End Connections: Male threaded or grooved.
 - 6. Lining: Inert and noncorrosive, propylene.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Division 22 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Division 22 "Domestic Water Piping Specialties."
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install domestic water piping level without pitch and plumb.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

- H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 3 and Smaller: Use dielectric couplings, nipples, or unions.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Division 22 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8 inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8 inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8 inch rod.
 - 4. NPS 1-1/2: 72 inches with 3/8 inch rod
 - 5. NPS 2: 96 inches with 3/8 inch rod
 - 6. NPS 2-1/2: 108 inches with 1/2 inch rod.
- C. Install supports for vertical copper tubing every 10 feet.
- D. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4 and Smaller: 84 inches with 3/8 inch rod.
 - 2. NPS 1-1/2: 108 inches with 3/8 inch rod.
 - 3. NPS 2: 10 feet with 3/8 inch rod.
 - 4. NPS 2-1/2: 11 feet with 1/2 inch rod.
- E. Install supports for vertical steel piping every 15 feet.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 2. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

3.6 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Division 22 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Re-inspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for re-inspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures required in CPC 609.9 and as prescribed by the Health Authority. If methods are not prescribed follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. The procedure shall be repeated where it is shown by a bacteriological examination made by an approved agency that contamination persists in the system.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints NPS 4 and larger, unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping shall be the following:
 1. Hard copper tube, ASTM B 88, Type L; cast-or wrought-copper solder-joint fittings; and soldered joints.

3.11 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use ball valves for piping NPS 3 and smaller.
 2. Hot-Water Circulation Piping, Balancing Duty: Calibrated, Memory-stop balancing valves.
 3. Drain Duty: Hose-end ball valves.

END OF SECTION

SECTION 22 11 19 DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Balancing valves.
 - 4. Strainers.
 - 5. Hose bibbs.
 - 6. Drain valves.
 - 7. Water-hammer arresters.
 - 8. Trap-seal primer valves.
 - 9. Flexible connectors.
- B. Related Requirements:
 - 1. Division 22 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
 - 2. Division 22 "Domestic Water Piping" for water meters.

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cash Acme (www.cashacme.com)
 - b. Watts; a Watts Water Technologies Company (www.watts.com)
 - c. Zurn Industries, LLC (www.zurn.com)
 - 2. Standard: ASSE 1001.
 - 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 4. Body: Bronze.
 - 5. Inlet and Outlet Connections: Threaded.

6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrowhead Brass Products (www.arrowheadbrass.com)
 - b. MIFAB, Inc. (www.mifab.com)
 - c. Watts; a Watts Water Technologies Company (www.watts.com)
 - d. Woodford Manufacturing Company (www.woodfordmfg.com)
 - e. Zurn Industries, LLC (www.zurn.com)
2. Standard: ASSE 1011.
3. Body: Bronze, non-removable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co. (www.amesfirewater.com)
 - b. FEBCO (www.febcoonline.com)
 - c. Watts; a Watts Water Technologies Company (www.watts.com)
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Refer to equipment schedule for capacity and characteristics.
5. Body: Bronze for NPS 2 and smaller; with interior lining that complies with AWWA C550 or that is FDA approved or stainless steel for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.5 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ITT Corporation (bellgossett.com)
 - b. Armstrong International, Inc. (www.armstronginternational.com)
2. Type: Y-pattern globe valve with two readout ports and memory-setting indicator.
3. Body: Brass or bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron [with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and] for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch

- b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch
 - c. Strainers NPS 5 and Larger: 0.125 inch.
6. Drain: Pipe plug.

2.7 HOSE BIBBS

A. Hose Bibbs:

- 1. Standard: ASME A112.18.1 for sediment faucets.
- 2. Body Material: Bronze.
- 3. Seat: Bronze, replaceable.
- 4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
- 5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
- 6. Pressure Rating: 125 psig.
- 7. Vacuum Breaker: Integral non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
- 8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
- 9. Finish for Finished Rooms: Chrome or nickel plated.
- 10. Operation for Equipment Rooms: Wheel handle or operating key.
- 11. Operation for Finished Rooms: Operating key.
- 12. Include operating key with each operating-key hose bibb.
- 13. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.8 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

- 1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
- 2. Pressure Rating: 400-psig minimum CWP.
- 3. Size: NPS 3/4.
- 4. Body: Copper alloy.
- 5. Ball: Chrome-plated brass.
- 6. Seats and Seals: Replaceable.
- 7. Handle: Vinyl-covered steel.
- 8. Inlet: Threaded or solder joint.
- 9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.9 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc. (www.mifab.com)
 - b. Precision Plumbing Products (www.pppinc.net)
 - c. Sioux Chief Manufacturing Company, Inc. (www.siouxchief.com)
- 2. Standard: ASSE 1010 or PDI-WH 201.
- 3. Type: Metal bellows or Copper tube with piston.
- 4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.10 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc. (www.mifab.com)
 - b. Precision Plumbing Products (www.pppinc.net)
 - c. Sioux Chief Manufacturing Company, Inc. (www.siouxchief.com)
- 2. Standard: ASSE 1018.
- 3. Pressure Rating: 125 psig minimum.
- 4. Body: Bronze.

5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co. (www.jrsmith.com)
2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.
4. Material: Chrome-plated, cast brass.

2.11 FLEXIBLE CONNECTORS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flex-Hose Co., Inc. (www.flexhose.com)
 - b. Metraflex Company (www.metraflex.com)
 - c. Universal Metal Hose (www.hyspan.com)
- B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 1. Working-Pressure Rating: Minimum 200 psig.
 2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
 3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.
- C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
 1. Working-Pressure Rating: Minimum 200 psig.
 2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
 3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install water-hammer arresters in water piping according to PDI-WH 201.
- D. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 1. Reduced-pressure-principle backflow preventers.
 2. Calibrated balancing valves.

3. Primary, thermostatic, water mixing valves.
 4. Supply-type, trap-seal primer valves.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 "Identification for Plumbing Piping and Equipment."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Set field-adjustable flow set points of balancing valves.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10 foot head of water.

1.4 ACTION SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner no fewer than two weeks in advance of proposed interruption of sanitary waste service.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Tyler Pipe; a subsidiary of McWane Inc. (www.tylerpipe.com)
 - b. AB&I Foundry (www.abifoundry.com)
 - c. ANACO-Husky. (www.anaco-husky.com)
 - 2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. ANACO-Husky. (www.anaco-husky.com)
 - b. Clamp-All Corp (www.normaamericasds.com)
 - c. Mission Rubber Company, LLC; a division of MCP Industries (www.missionrubber.com)
2. Standards: Factory Mutual Standard 1680, Class I.
 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
- D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Sanitary sewer piping more than 5 feet outside the building is specified in Division 33 "Sanitary Sewerage."
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8 bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 1. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- L. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

3.2 PLUMBING SPECIALTIES

- A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 "Sanitary Waste Piping Specialties."
- B. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 "Sanitary Waste Piping Specialties."
- C. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8 inch rod.
 - 2. NPS 3: 60 inches with 1/2 inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8 inch rod.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8 inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8 inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2 inch rod.
 - 4. NPS 3 and NPS 5: 10 feet with 1/2 inch rod.
- F. Install supports for vertical copper tubing every 10 feet.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 5. Comply with requirements for cleanouts and drains specified in Division 22 "Sanitary Waste Piping Specialties."
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.6 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
- C. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1 inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

3.8 PIPING SCHEDULE

- A. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
1. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty cast-iron hubless-piping couplings; coupled joints.
 2. Copper DWV tube, copper drainage fittings, and soldered joints.
- B. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
1. Hubless, cast-iron soil pipe and fittings; standard hubless-piping couplings; and coupled joints.
 2. Copper DWV tube, copper drainage fittings, and soldered joints.
 - a. Option for Vent Piping, Hard copper tube, Type L; copper pressure fittings; and soldered joints.

END OF SECTION

SECTION 22 13 19 SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Miscellaneous sanitary drainage piping specialties.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.6 COORDINATION

- A. Coordinate size and location of roof penetrations.

PART 2 PRODUCTS

2.1 CLEANOUTS

- A. Exposed Metal Cleanouts:
 - 1. ASME A112.36.2M, Cast-Iron Cleanouts:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Zurn Industries, LLC. (www.zurn.com)
 - 2) Jay R. Smith Mfg. Co (www.jrsmith.com)
 - 3) MIFAB, Inc. (www.mifab.com)
 - 2. Standard: ASME A112.36.2M for cast iron.
 - 3. Size: Same as connected drainage piping
 - 4. Body Material: Hubless, cast-iron soil pipe test tee.
 - 5. Closure: Raised-head, brass plug.
 - 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Metal Floor Cleanouts:
 - 1. ASME A112.36.2M, Cast-Iron Cleanouts:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Jay R. Smith Mfg. Co (www.jrsmith.com)
 - 2) Zurn Industries, LLC. (www.zurn.com)
 - 3) MIFAB, Inc. (www.mifab.com)

2. Standard: ASME A112.36.2M for adjustable housing cast-iron soil pipe with cast-iron ferrule cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Closure: Brass plug with tapered threads.
7. Frame and Cover Material and Finish: Nickel-bronze.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co (www.jrsmith.com)
 - b. MIFAB, Inc. (www.mifab.com)
 - c. Zurn Industries, LLC. (www.zurn.com)
2. Size: Same as connected drainage piping.
3. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure: Raised-head brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co (www.jrsmith.com)
 - b. MIFAB, Inc. (www.mifab.com)
 - c. Zurn Industries, LLC. (www.zurn.com)
2. Body Material: Gray iron.
3. Seepage Flange: Required.
4. Anchor Flange: Required.
5. Clamping Device: Required.
6. Outlet: Bottom.
7. Top of Body and Strainer Finish: Nickel bronze

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. Assemble open drain fittings and install with top of hub 2 inches above floor.
- F. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Division 22 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 60 00
MEDICAL GAS PIPING FOR HEALTHCARE FACILITIES

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. Oxygen piping.
 - 2. Vacuum piping
 - 3. Valves
 - 4. Service Connections

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For medical gas piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Medical Gas Piping Systems for Healthcare Facilities: According to ASSE Standard #6010 for medical-gas-system installers.
- B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the medical gas piping testing indicated, that is a member of the Medical Gas Professional Healthcare Organization or is an NRTL, and that is acceptable to authorities having jurisdiction.
 - 1. Qualify testing personnel according to ASSE Standard #6020 for medical-gas-system inspectors and ASSE Standard #6030 for medical-gas-system verifiers.
- C. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications"; or AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Medical oxygen
- B. Medical vacuum

2.2 PIPES, TUBES, AND FITTINGS

- A. Comply with NFPA 99 for medical gas piping materials.
- B. Copper Medical Gas Tube: ASTM B 819, Type L, seamless, drawn temper that has been manufacturer cleaned, purged, and sealed for medical gas service; or according to CGA G-4.1 for oxygen service. Include standard color marking "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in blue for Type L tube.

- C. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type that has been manufacturer cleaned, purged, and bagged for oxygen service according to CGA G-4.1.

2.3 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys.
- B. Threaded-Joint Tape: PTFE.

2.4 VALVES

- A. General Requirements for Valves: Manufacturer cleaned, purged, and bagged according to CGA G-4.1 for oxygen service.
- B. Zone-Valve Box Assemblies: Box with medical gas valves, tube extensions, and gages.
 - 1. Zone-Valve Boxes:
 - a. Steel Box with Aluminum Cover:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - (a) BeaconMedaes. (www.beaconmedaes.com)
 - (b) Amico Corporation (www.amico.com)
 - b. Description: Formed steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gages and in sizes required to permit manual operation of valves. Medical air and medical vacuum tubing, valves, and gages may be incorporated in zone valve boxes for medical gases.
 - 1) Interior Finish: Factory-applied white enamel.
 - 2) Cover Plate: Aluminum or stainless steel with frangible or removable windows.
 - 3) Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, according to NFPA 99.
- C. Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BeaconMedaes (beaconmedaes.com)
 - b. Amico Corporation (www.amico.com)
 - 2. Standard: MSS SP-110.
 - 3. Description: Three-piece body, brass or bronze.
 - 4. Pressure Rating: 300 psig minimum.
 - 5. Ball: Full-port, chrome-plated brass.
 - 6. Seats: PTFE or TFE.
 - 7. Handle: Lever type with locking device.
 - 8. Stem: Blowout proof with PTFE or TFE seal.
 - 9. Ends: Manufacturer-installed ASTM B 819, copper-tube extensions and manufacturer-installed ASTM B 819, copper-tube extensions with pressure gage on one copper-tube extension.

2.5 MEDICAL GAS SERVICE CONNECTIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. BeaconMedaes (beaconmedaes.com)
 - 2. Amico Corporation (www.amico.com)
- B. General Requirements for Medical Gas Service Connections:
 - 1. Suitable for specific medical gas pressure and suction service listed.
 - 2. Include roughing-in assemblies, finishing assemblies, and cover plates.
 - 3. Individual cover plates are not required if service connection is in multiple unit or assembly with cover plate.
 - 4. Recessed-type units made for concealed piping unless otherwise indicated.

- C. Roughing-in Assembly:
 - 1. Steel outlet box for recessed mounting and concealed piping.
 - 2. Brass-body outlet block with secondary check valve that will prevent gas flow when primary valve is removed. Suction inlets to be without secondary valve.
 - 3. Double seals that will prevent gas leakage.
 - 4. ASTM B 819, NPS 3/8copper outlet tube brazed to valve with service marking and tube-end dust cap.
- D. Finishing Assembly:
 - 1. Brass housing with primary check valve.
 - 2. Double seals that will prevent gas leakage.
 - 3. Cover plate with gas-service label.
- E. Cover Plates: One piece, aluminum or stainless steel and permanent, color-coded, identifying label matching corresponding service.

PART 3 EXECUTION

3.1 PREPARATION

- A. Cleaning of Medical Gas Tubing: If manufacturer-cleaned and -capped fittings or tubing is not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:
 - 1. Clean medical gas tube and fittings, valves, gages, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service according to CGA G-4.1.
 - 2. Wash medical gas tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of 1 lb. of chemical to 3 gal. of water.
 - a. Scrub to ensure complete cleaning.
 - b. Rinse with clean, hot water to remove cleaning solution.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of gas piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Comply with NFPA 99 for installation of medical gas piping.
- C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.
- F. Install piping adjacent to equipment and specialties to allow service and maintenance.
- G. Install piping to permit valve servicing.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and for branch connections.
- J. Install medical gas piping to medical gas service connections specified in this Section, to medical gas service connections in equipment specified in this Section, and to equipment specified in other Sections requiring medical gas service.
- K. Install medical gas service connections recessed in walls. Attach roughing-in assembly to substrate; attach finishing assembly to roughing-in assembly.

- L. Connect gas piping to gas sources and to gas outlets and equipment requiring gas service.

3.3 VALVE INSTALLATION

- A. Install shutoff valve at each connection to healthcare equipment and specialties.
- B. Install check valves to maintain correct direction of gas flow from healthcare gas supplies.
- C. Install valve boxes recessed in wall and anchored to substrate. Single boxes may be used for multiple valves that serve same area or function.
- D. Install zone valves and gages in valve boxes. Arrange valves so largest valve is lowest. Rotate valves to angle that prevents closure of cover when valve is in closed position.

3.4 JOINT CONSTRUCTION

- A. Remove scale, slag, dirt, and debris from outside of cleaned tubing and fittings before assembly.
- B. Threaded Joints: Apply appropriate tape to external pipe threads.
- C. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" chapter. Continuously purge joint with oil-free, dry nitrogen during brazing.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Division 22 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.
- B. Install hangers and supports for healthcare medical gas piping systems according to NFPA 99.

3.6 IDENTIFICATION

- A. Install identifying labels and devices for specialty gas piping, valves, and specialties. Comply with requirements in Division 22 "Identification for Plumbing Piping and Equipment."
- B. Install identifying labels and devices for healthcare medical gas piping systems according to NFPA 99. Use the following or similar captions and color-coding for piping products where required by NFPA 99:
 - 1. Oxygen: White letters on green background or green letters on white background.

3.7 FIELD QUALITY CONTROL FOR HEALTHCARE FACILITY MEDICAL GAS

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Medical Gas Piping Testing Coordination: Perform tests, inspections, verifications, and certification of medical gas piping systems concurrently with tests, inspections, and certification of medical compressed-air piping and medical vacuum piping systems.
 - 2. Preparation: Perform the following Installer tests according to requirements in NFPA 99 and ASSE Standard #6010:
 - a. Initial blowdown.
 - b. Initial pressure test.
 - c. Cross-connection test.
 - d. Piping purge test.
 - e. Standing pressure test for positive-pressure medical gas piping.
 - f. Standing pressure test for vacuum systems.
 - g. Repair leaks and retest until no leaks exist.
 - 3. System Verification: Perform the following tests and inspections according to NFPA 99, ASSE Standard #6020, and ASSE Standard #6030:
 - a. Standing pressure test.
 - b. [Individual-pressurization] [or] [pressure-differential] cross-connection test.
 - c. Valve test.
 - d. Master and area alarm tests.

- e. Piping purge test.
 - f. Piping particulate test.
 - g. Piping purity test.
 - h. Final tie-in test.
 - i. Operational pressure test.
 - j. Medical gas concentration test.
 - k. Medical air purity test.
 - l. Verify correct labeling of equipment and components.
 - m. Verify medical gas supply sources.
4. Testing Certification: Certify that specified tests, inspections, and procedures have been performed and certify report results. Include the following:
- a. Inspections performed.
 - b. Procedures, materials, and gases used.
 - c. Test methods used.
 - d. Results of tests.
- C. Remove and replace components that do not pass tests and inspections and retest as specified above.
- D. Prepare test and inspection reports.

3.8 PROTECTION

- A. Protect tubing from damage.
- B. Retain sealing plugs in tubing, fittings, and specialties until installation.
- C. Clean tubing not properly sealed, and where sealing is damaged, according to "Preparation" Article.

3.9 PIPING SCHEDULE

- A. Medical Gas Piping: Type L, copper tube; wrought-copper fittings; and brazed joints.

3.10 VALVE SCHEDULE

- A. Shutoff Valves: Ball valve with manufacturer-installed ASTM B 819, copper-tube extensions.
- B. Zone Valves: Ball valve with manufacturer-installed ASTM B 819, copper-tube extensions with pressure gage on one copper-tube extension.

END OF SECTION

SECTION 23 05 00 COMMON WORK RESULTS FOR HVAC

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. Design Development
 - 1. Documents: Design development specifications may include plumbing and HVAC equipment not required for this project. Equipment and capacities are identified on the drawings. These documents are not for construction.
- B. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. HVAC demolition.

1.3 BASIS-OF-DESIGN

- A. Equipment manufacturers listed on the equipment schedules are the basis-of-design. Manufacturers listed in the specification other than the basis-of design manufacture are acceptable substitutions. Equipment schedules are on the drawings. Refer to specifications for unscheduled equipment.

1.4 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
 - 2. Escutcheons.

1.6 QUALITY ASSURANCE

- A. Comply with ASHRAE Guideline 4 – 2008 Preparation of operating and maintenance documentation for building systems.

- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

1.7 GUIDELINES, CODES AND STANDARDS

- A. Refer to the most recently published edition for references to guidelines, and standards (examples: ASHRAE, NFPA, AWWA, ASTM) unless a specific edition is listed.
- B. Installation and materials shall comply with applicable state, and local codes and ordinances.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Deliver ducts and air handling equipment with factory or shop applied protective covering. Protective covering shall remain until installation.
- C. Materials and equipment stored on site shall have a protective covering; open ends on equipment connections and ducts shall be covered. Duct liner shall be encapsulated.

1.9 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hart Industries, International, Incorporated (www.hartindustries.com)
 - 2. Pipeline Seal and Insulator, Incorporated (Pipeline Seal and Insulator, Incorporated)
 - 3. Watts Industries, Incorporated; Water Products Division (www.watts.com)
- B. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- C. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- E. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 degrees F.

PART 3 EXECUTION

3.1 HVAC DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.

- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Sleeves are not required for core-drilled holes through walls.
- M. Verify final equipment locations for roughing-in.
- N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or flanges.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.4 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in steel piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Wet Piping Systems: Install dielectric nipple fittings to connect piping materials of dissimilar metals.

END OF SECTION

SECTION 23 07 13 DUCT INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply air.
 - 2. Indoor, concealed return air.
 - 3. Indoor, concealed transfer air.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Insulation shall be installed by a licensed insulation contractor, not the mechanical or plumbing contractor. Submit License information within submittal package.
- C. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required. Insulation application may begin on segments that have satisfactory test results.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FRK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to it and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; CP-127. Eagle Bridges - Marathon Industries; 225.
 - b. Foster Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; 85-60/85-70. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Adhesive shall comply 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."
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; 85-50. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Adhesive shall comply 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."

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; CP-30.
 - b. Eagle Bridges - Marathon Industries; 501.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; 30-35.
 - d. Mon-Eco Industries, Inc.; 55-10.
 - 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 - 3. Service Temperature Range: 0 to 180 deg F.
 - 4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 - 5. Color: White.
 - 6. percent by volume and 66 percent by weight.
 - 7. Color: White.

2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
 - 1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; CP-50 AHV2.Foster Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; 30-36.
 - b. Vimasco Corporation; 713 and 714.
 - 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
 - 4. Service Temperature Range: 0 to plus 180 deg F.
 - 5. Color: White.

2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; CP-76.Eagle Bridges - Marathon Industries; 405.
 - b. Foster Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; 95-44.
 - c. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply 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."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply 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."

2.6 FACTORY-APPLIED JACKETS

- A.** Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A.** Woven Glass-Fiber Fabric: Approximately 6 oz. /sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; Chil-Glas No. 5.
- B.** Woven Polyester Fabric: Approximately 1 oz. /sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; Mast-A-Fab.
 - b. Vimasco Corporation; Elastafab 894.
 - c. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.8 TAPES

- A.** ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.
 6. Tensile Strength: 40-lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40-lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 488 AWF.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - c. Compac Corporation; 120.
 - d. Venture Tape; 3520 CW.
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34-lbf/inch in width.

2.9 SECUREMENTS

- A. Bands:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
 2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with closed seal.
- B. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.105 inch diameter shank, length to suit depth of insulation indicated.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc.; CWP-1.
 - 2) GEMCO; CD.
 - 3) Midwest Fasteners, Inc.; CD.
 - 4) Nelson Stud Welding; TPA, TPC, and TPS.
 2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.105 inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2 inch galvanized carbon-steel washer.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc.; CHP-1.
 - 2) GEMCO; Cupped Head Weld Pin.
 - 3) Midwest Fasteners, Inc.; Cupped Head.
 - 4) Nelson Stud Welding; CHP.
- C. Staples: Outward-clinching insulation staples, nominal 3/4 inch wide, stainless steel or Monel.

- D. Wire: 0.062 inch soft-annealed, stainless steel
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. C & F Wire.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3 inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Section 078400 "Firestopping".

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 75 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2 inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18 foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Overlap unraced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6 inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 1. Indoor, concealed supply air.
 2. Indoor, concealed return air..
 3. Indoor, concealed transfer air.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, rectangular or round, supply-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Concealed, rectangular or round return-air duct located in conditioned spaces; insulation shall be the following:
 1. Mineral-Fiber Blanket: 1 1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Concealed, rectangular or round transfer-air duct located in conditioned spaces; insulation shall be the following:
 1. Mineral-Fiber Blanket: 1 1/2 inches thick and 0.75-lb/cu. ft. nominal density.

END OF SECTION

SECTION 23 31 13 METAL DUCTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Adhesives.
 - 2. Sealants and gaskets.

1.3 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers:

- a. Ductmate Industries, Incorporated
 - b. McGill AirFlow Corporation.
 - c. Semco Incorporated.
 - d. Sheetmetal Connectors Incorporated.
 - e. Spiral Manufacturing Company
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 1. Transverse Joints in Ducts Larger Than 60 in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
- 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
- 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Tape Width: 4 inches.
 - 3. Sealant: Modified styrene acrylic.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 7. Service: Indoor and outdoor.
 - 8. Service Temperature: Minus 40 to plus 200 deg F.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
- C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports:
 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 DUCT SEALING

- A. Seal ducts at a minimum to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Exhaust Ducts: Seal Class C.
 - 3. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 4. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 5. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 6. Conditioned Space, Return-Air Ducts: Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:

- a. Supply Ducts with a Pressure Class of higher than 2-Inch wg: Test representative duct sections selected by building owner or designated representative of building owner from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.
- 3. Leak test each section of duct within a concealed shaft regardless of pressure class.
- 4. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
- 5. Test for leaks before applying external insulation.
- 6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
- 7. Give seven days' advance notice for testing.
- C. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for ducts with a Duct Pressure Classification greater than 2-inches, and for Leakage Class 6 for ducts with duct pressure classification 2-inches or less.
 - a. For a duct section with greater than 2-inch Duct Pressure Classification, leakage shall not exceed 7.5 CFM per 100 sq. ft. of duct surface area.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.7 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
- B. Supply Ducts:
 - 1. Ducts Connected to Terminal Units and Transfer Air.
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round: 6.
- C. Return Ducts:
 - 1. Ducts Connected to Terminal Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round: 6.
- D. Exhaust Ducts:
 - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative: 2-inch wg.
 - b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round: 6.
- E. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel.
 - 2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
- F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm :
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.
- G. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 3. See drawing details for additional requirements.

END OF SECTION

SECTION 23 33 00 AIR DUCT 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. Manual volume dampers.
 - 2. Flange connectors.
 - 3. Turning vanes.
 - 4. Flexible connectors.
 - 5. Flexible ducts.
 - 6. Duct accessory hardware.

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers: Maximum velocity 1500 fpm.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Incorporated; a Division of Mestek, Incorporated. (www.airbalance.com)
 - b. McGill AirFlow LLC. (www.mcgillairflow.com)
 - c. Nailor Industries Incorporated. (www.nailor.com)
 - d. Pottorff. (www.pottorff.com)
 - e. Ruskin Company. (www.ruskin.com)
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Maximum air velocity: 1500 fpm.
 - 4. Suitable for horizontal or vertical applications.
 - 5. Frames:
 - a. Frame: 5-inches wide, Hat-shaped, 0.064-inch- thick, galvanized sheet steel with reinforced corners.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.

6. Blades:
 - a. Multiple or single blade.
 - b. 6-inches wide.
 - c. Parallel- or opposed-blade design.
 - d. Stiffen damper blades for stability.
 - e. Galvanized-steel, 0.064 inch thick.
 7. Blade Axles: ½-inch Galvanized steel.
 8. Bearings:
 - a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axle's full length of damper blades and bearings at both ends of operating shaft.
 9. Tie Bars and Brackets: Galvanized steel.
 10. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.
- B. Jackshaft:
1. Size: 0.5-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.

2.3 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Incorporated. (www.ductmate.com)
 2. Elgen Manufacturing. (www.elgenmfg.com)
 3. Nexus PDQ; Division of Shilco Holdings Incorporated. (www.nexuspdq.com)
- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
1. Material: Galvanized steel.
 2. Gage and Shape: Match connecting ductwork.

2.4 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Incorporated. (www.ductmate.com)
 2. Elgen Manufacturing. (www.elgenmfg.com)
 3. Sheetmetal Connectors Incorporated. (www.smcduct.com)
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
1. Vane Construction: Single and Double wall.
 2. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.5 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- Ductmate Industries, Incorporated. (www.ductmate.com)
 - Duro Dyne Incorporated. (www.durodyne.com)
 - Elgen Manufacturing. (www.elgenmfg.com)
 - Ventfabrics, Incorporated. (www.ventfabrics.com)
 - Ward Industries, Incorporated.; a Division of Hart & Cooley, Incorporated. (www.hartandcooley.com)
- Materials: Flame-retardant or noncombustible fabrics.
 - Coatings and Adhesives: Comply with UL 181, Class 1.
 - Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
 - Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - Minimum Weight: 26 oz. /sq. yd.
 - Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - Service Temperature: Minus 40 to plus 200 deg F.
 - Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - Minimum Weight: 24 oz. /sq. yd.
 - Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - Service Temperature: Minus 50 to plus 250 deg F.
 - High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
 - Minimum Weight: 16 oz. /sq. yd.
 - Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
 - Service Temperature: Minus 67 to plus 500 deg F.
 - High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
 - Minimum Weight: 14 oz. /sq. yd.
 - Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
 - Service Temperature: Minus 67 to plus 500 deg F.
 - Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 - Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.6 DUCT ACCESSORY HARDWARE

- Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
 - 1. Duct openings shall be free of any obstruction or irregularities that interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4" larger than damper dimensions and shall be square, straight, and level.
 - 2. Multiple damper sections will be square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be equal $\pm 1/8$ -inches.
 - 3. Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
 - 4. Damper blades, axles, and linkage shall operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
 - 5. Provide a visible and accessible indication of damper position on the drive shaft end.
 - 6. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.
- C. Install manual volume dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff. Install manual volume dampers as indicated on the Drawings and Details, and as necessary to accomplish system air balancing. As a minimum, manual volume dampers will be provided at every divided flow main or branch duct, at every branch duct take off, and every duct extending to individual register, grille, or diffuser. Manual volume dampers are not required upstream of variable volume air terminal units.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install remote damper operators for volume dampers located above gypsum board, plaster, and other hard ceilings.
 - 3. Set dampers to fully open position before testing, adjusting, and balancing.
- D. Install test holes at fan inlets and outlets and elsewhere as indicated.
- E. Install flexible connectors to connect ducts to equipment.
 - 1. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- F. Installation of Flexible Ducts
 - 1. Install flexible ducts according to the manufacturer's instructions, applicable SMACNA standards, drawing details, and as follows:
 - a. Duct Collars: Provide tap-in collars 4-inches minimum in length with a formed bead 1-inch from the end for attachment of flexible duct. Extend minimum collar length for manual volume dampers.
 - b. Connections: Attach flexible duct to the tap-in collars and to sleeves with a duct clamp (draw band) around the inner liner and a second draw band around the insulation jacket. Position duct clamps behind the beads on the collar or sleeve. Duct clamps may be screwed stainless steel bands or nylon straps tightened with a compression tool.
 - c. Duct Supports: Support flexible duct at the manufacturer's recommended interval, but not less than every 5 feet. Maximum permissible sag is 1/2-inch per foot of spacing between supports (maximum of 1-1/4-inches over five feet).
 - d. Duct Hangers: Provide hanger straps in contact with the flexible duct at least 2-inch wide so the internal diameter of the duct is not reduced at the point of support.

- e. Duct Bends: Make bends or turns in flexible ducts with not less than a one-duct diameter throat radius.
- f. Connect diffusers, registers, grilles, and light troffer boots to low pressure ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place. Refer to drawing details for additional requirements.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

- 1. Operate dampers to verify full range of movement.
- 2. Inspect locations of access doors and verify that purpose of access door can be performed.
- 3. Inspect turning vanes for proper and secure installation.
- 4. Install duct test holes where required for testing and balancing purposes.
- 5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES-HOSPITALS

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: Refer to Diffuser/Register Schedule on drawings:
 - 1. Rectangular and square ceiling diffusers.
 - 2. Louver face diffusers.
- B. Related Sections:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, mounting surface, border, frame, and accessories furnished.

1.4 COORDINATION

- A. Review the architectural drawings for diffuser, register, and grille mounting surfaces.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

- A. Louver Face Diffuser:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Price Industries.
 - b. Titus.
 - c. Krueger.
 - 2. Accessories: Refer to the drawings and equipment schedules for accessories.
 - a. Throw reducing vanes.

2.2 REGISTERS AND GRILLES

- A. Fixed Face Register:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Price Industries.
 - b. Titus.
 - c. Krueger.
 - 2. Material: Steel.
 - 3. Finish: Baked enamel, white.
 - 4. Face Arrangement: Refer to register schedule.
 - 5. Frame: Minimum 20 Gauge Steel.
- B. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Price Industries.
 - b. Titus.
 - c. Krueger.
2. Material: Steel or Aluminum
3. Finish: Baked enamel, white
4. Face Arrangement: Refer to grille schedule.
5. Core Construction: Refer to grille schedule.
6. Frame: Minimum 20 Gauge Steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Provide the appropriate mounting frame or border for each diffuser register or grille location. Verify ceiling grid type for lay-in type inlets and outlets. Non-lay-in diffusers, registers, and grilles will have frames or borders for surface mounting.

3.2 INSTALLATION

- A. Diffuser, register, and grille sizes and locations are indicated on the drawings and schedules.
- B. Install diffusers, registers, and grilles level and plumb.
- C. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- D. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- E. Install equalizing grids on round neck ceiling diffusers with an inlet duct of less than one diameter in length.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

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. Electrical equipment coordination and installation.
 - 2. Common electrical installation requirements.
 - 3. Demolition.
 - 4. Cutting and patching for electrical construction.
 - 5. Disposition of existing materials and equipment.
 - 6. Electric Service Outage and Energizations.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. Comply with State Code requirements.
- D. All materials shall meet the standards of the following institutes where applicable:
 - 1. National Fire Protection Association (NFPA)
 - 2. American Society of Testing Materials (ASTM)
 - 3. American National Standards Institute (ANSI)
 - 4. National Electrical Manufacturer's Association (NEMA)
 - 5. Institute of Electrical and Electronic Engineers (IEEE)

1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices.
- C. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability. Document results of said testing.

1.5 DRAWINGS

- A. The drawings indicate the arrangements of electrical equipment. Review architectural drawings and details for door swings, cabinets, counters and built-in equipment; conditions indicated on architectural plans shall govern. Coordinate installation of electrical equipment with structural system and mechanical equipment and access thereto. Coordinate installation of recessed electrical equipment with concealed ductwork and piping, and wall thickness. All devices, raceway, and electrical equipment in finished and/or public spaces shall be recessed or concealed unless otherwise noted.
- B. Do not scale drawings. Obtain dimensions for layout of equipment from Architectural plans and details unless indicated on Electrical plans.
- C. Bring all discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions to the immediate attention of the Architect.
- D. Equipment layout is based on one manufacturer's product or from composite dimensions from multiple manufacturers. Where equipment selected for use on the job differs from layout, coordinate space requirements and connection arrangements.

1.6 EQUIPMENT REQUIRING ELECTRICAL SERVICE

- A. Review all specification sections and drawings for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service.
- B. Drawings indicate design loads, voltages and corresponding control equipment, feeders, and overcurrent devices. If equipment actually furnished have loads other than those indicated on the drawings or specified herein, control equipment, feeders, and overcurrent devices shall be adjusted in size accordingly at no additional cost to the owner. Such adjustment shall be subject to the review of the Architect.
- C. Incidental items not indicated on Drawing or mentioned in Specifications but that can legitimately and reasonably be inferred to belong to the Work or be necessary in good practice to provide complete system, shall be furnished and installed though not itemized here in detail.

1.7 MECHANICAL SYSTEMS INTERFACE

- A. All control wiring for plumbing, heating, ventilating and air conditioning systems shall be installed under Division 23. Review Division 23 specifications and shop drawings for control systems to assure compatibility between equipment furnished under Division 23 and wiring furnished under Division 26.

1.8 SITE INVESTIGATION

- A. Prior to submitting bids of the project, visit the site of the work to become aware of existing conditions which may affect the cost of the project. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems shall be restored to their original condition, with the exception of the work under this contract, before the completion of this project. Existing systems and conditions which are not detailed on the drawings must still be restored to their original condition.

1.9 EQUIVALENTS AND SUBSTITUTIONS

- A. The applicable paragraphs for General Requirements, Division 01 apply herein.
- B. Basis of Design: The manufacturer's name and product listed on the drawings, or listed first of several names in these Specifications, is used as a basis for design to establish space requirements, a standard of quality and performance.
- C. Equivalents: Products of one or more other manufacturer's names listed in these Specifications following the words "or equivalent by" may be selected, subject to paragraph below titled "Contractor's Responsibility for Equivalent and Substitutions".
- D. Other Options:

1. For products specified by naming only one manufacturer, refer to paragraph below under "Substitutions".
 2. For products specified only by performance characteristics or reference standards, select any manufacturer meeting the requirements.
- E. Substitutions: Requests for acceptance of a product of manufacturer's name not listed in these Specifications will be considered if any one of the following conditions is met:
1. The named product is not available because of strikes or discontinuance of manufacture; and the proposed product is equivalent to the named product.
 2. The proposed product is superior to the named product, in the opinion of the Owner's Representative.
 3. The proposed product is equivalent to the named product and its use will be to the advantage of the Owner, by the Owner receiving an equitable credit or cost savings. The Owner's Representative reserves the right to reject any substitution.
 4. Submit proposed substitutions with bid along with alternate price, complete descriptive data and a comparison of the substitute manufacturer's product with specified product. Request for acceptance of a product of manufacturer's name not listed in these Specifications, is subject to the paragraph titled "Contractor's Responsibility Equivalents and Substitutions".
- F. Contractor's Responsibility for Equivalents and Substitutions:
1. Items submitted as a substitution to the Basis of Design or listed general equivalents shall be identified as such and shall include a written request for substitution indicating the following:
 - a. Contract Price adjustment.
 - b. Contract time adjustment.
 - c. Item by item breakdown of differences between Basis of Design and substituted item.
 - d. Operation, maintenance and energy cost difference.
 2. Products of manufacturer must match the features, construction, performance and size of those selected for design. Standard catalogued may require certain modifications to meet specified requirements.
 3. The responsibility for providing that specified requirements have been met remains with the manufacturer and Contractor. Should the substituted item fail to perform in accordance with the Specifications, replace same with the originally specified item without extra cost to the contract.
 4. When requesting review of an equivalent or substituted product, submit a comparison chart listing features, construction, performance and sizes of name product versus equivalent or substituted product.
 5. Submittals for review of an equivalent or substituted product will be reviewed for acceptability when all the above requirements have been met. Contractor shall be responsible for all costs incurred by the Architect and Engineer for review of equivalency beyond initial review.
 6. Coordinate the installation of the product with all trades.
 7. Contractor shall be responsible for changes in electric wiring, materials and for all other additional costs of construction by all trades involved to accommodate the product to perform the same as the product used in the "Basis of Design".
 8. Coordination of General Equivalents and Substitutions: Where Contract Documents permits selection from general equivalents, or where substitutions are authorized, coordinate clearance and other interface requirements with other work.
 9. Provide necessary additional items so that selected or substituted item operates equivalent to the Basis of Design and properly fits in the available space allocated for the Basis of Design.
 10. Contractor is responsible for assuring that piping, conduit, duct, flue and other service locations for general equivalents or substitutions do not cause access, service or operational difficulties any greater than would be encountered with the Basis of Design.
 11. Failure to comply with these requirements will result in immediate rejection of the request for substitution.

1.10 GENERAL SUBMITTAL REQUIREMENTS

- A. Refer to Division 01 for additional requirements.
- B. Coordination and Sequencing:
 1. Coordinate submittals 3 weeks (minimum) prior to expected order date so that work will not be delayed by submittals.

2. Do not submit product data, or allow its use on the project until compliance with requirement of Contract Documents has been confirmed by Contractor.
 3. Submittal is for information and record, unless otherwise indicated, and is not a change order request.
 4. Submitting contractor is responsible for routing reviewed submittals to all parties affected including but not limited to electrical, building automation and temperature control, and test and balance subcontractors.
 5. Make submittals for group of similar products or materials or by area of work complete and at one time, not in piecemeal fashion.
 6. Identify submittals with Architect's project name and number, with item designation as indicated on drawings, and referenced to applicable paragraphs of the specifications. Submit in brochure form.
 7. Submittals of products needed to start of Project for its installation, or those requiring a long lead time for assembly or manufacturing, should be submitted before the others.
- C. Preparations of Submittals:
1. Refer to Division 01 requirements.
 2. Provide permanent marking on each submittal to identify project, date, Contractor, Subcontractor, Supplier, submittal name and similar information to distinguish it from other submittals.
 3. Indicate any portions of work, which deviate from the Contract Documents.
 - a. Explain the reasons for the deviations.
 - b. Show how such deviations coordinate with interfacing portions of other work.
 4. Show Contractor's executed review and approval marking.
 5. Provide space for the Owner's Representative "Action" marking.
 6. Submittals, which are received from sources other than through Contractor's office, will be returned "Without Action".
 7. Submittals shall be presented in a neat and legible fashion and shall be returned "Without Action" if presented in any other fashion.
- D. Response to Submittals: Where standard product data has been submitted, it is recognized:
1. That the Submitter has determined that the products fulfill the specified requirements.
 2. That the submittal is for the Owner's Representative information only, but will be returned with appropriate action where observed to be not in compliance with the requirements.
- E. If more than two submittals (either for shop drawings, or test reports) are made by the Contractor due to the incompleteness, non-compliance, errors, omissions, etc., the Owner reserves the right to charge the Contractor for subsequent reviews by their consultants. Such extra fees shall be deducted from payments by the Owner to the Contractor.

1.11 RECORD DRAWINGS

- A. Record drawings shall meet all "As-built" and "Record Drawings" requirements for <insert name of client or facility>. Coordinate all requirements with <insert name of client or facility> staff prior to completion.
- B. Drawings:
1. Record of Project Progress: Maintain drawings available at the job site for inspection. Keep an accurate, legible and continuously updated record of installed locations and all project revisions other than revised drawings issued by the Architect, including source and date of authorization. Utilize only contract drawing symbols for recording the work. Drawing notations to be sufficiently clear in the representation of the work, for utilization by a CADD operator (drafts person) who is not necessarily familiar with the installed work.
 2. Record of Installation: At the conclusion of the work, deliver one (1) set of updated drawings to the Owner's Representative for review. Following the review, Contractor shall have incorporated by a competent CADD operator all of the installed data represented on the project progress drawings.
 3. Include in Record Drawings the Following:

- a. Revisions, including sketches, bulletins, change orders, written addenda and directives, clarifications and responses generated by requests for information (RFIs), regardless of source of the revision.
- b. Location and configuration of equipment with related housekeeping pads.
- c. Physical routing of ductbank work, raceways, exposed and above ceilings with locations of fire dampers, combination fire/smoke dampers, smoke detectors, power supplies, etc., plainly marked and identified.
- d. Location of room controllers, switches, devices, and sensors.

PART 1 PRODUCTS

Not used

PART 3 EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- C. Comply with NECA 1.
- D. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- E. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- F. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- G. Right of Way: Give to piping systems installed at a required slope.
- H. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

3.1 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Section 078400 "Firestopping."

3.2 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Reroute circuits as required to serve equipment not in the demolition area.
- C. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- D. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- E. Remove demolished material from Project site.
- F. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.
- G. Remove devices on wall or ceilings being removed. Coordinate with other divisions.

- H. Assume that all existing equipment and fixtures indicated to be reused are in good working condition and can be installed without repairs. Notify the Architect of items found to be in need of repair or in unusable condition for direction or decision. Repair any damage to equipment caused in removal or handling
- I. Fixtures and other equipment removed and to be-used shall be cleaned before reinstallation. Provide new lamps for reused light fixtures.
- J. Added Circuits: All loads and circuits added to existing panelboards shall be balanced between phases. On existing panelboards where circuits are changed, replace panel directories with new typed directories.
- K. All material and equipment which is noted or required by the owner to be salvaged and which is not scheduled to be reused or relocated shall be carefully removed and shall be delivered to the owner and stored where directed on the site.
- L. Remove all abandoned low voltage wiring. All wiring disconnected on one or both ends is considered abandoned unless tagged and labeled "future" or "spare". Verify with Owner any cabling connected on both ends is still in use prior to removal.

3.3 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 - 1. Firestopping.
 - 2. Electrical demolition.
 - 3. Cutting and patching for electrical construction.
- B. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- C. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.5 DISPOSITION OF EXISTING BALLASTS CONTAINING PCBs

- A. Environmental Protection Agency (EPA) Regulations require controlled disposal of fluorescent light ballasts containing polychlorinated biphenyls (PCBs) when removed from service. The ballasts involved were generally manufactured between 1950 and 1979.
- B. Provide suitable ballast collection containers at the project site. Check the ballasts in all fluorescent fixtures removed from service under this contract. Some ballasts may be labeled to indicate whether they do or do not contain PCBs. Remove from the fixtures all ballasts known or assumed to contain PCBs and place them in the designated ballast collection container and arrange for the disposal of the ballasts off the site in manner approved by the EPA.
- C. Bear all cost for ballast recycling.

3.6 DISPOSITION OF EXISTING FLUORESCENT LAMPS

- A. EPA Regulations require the controlled disposal of fluorescent lamps.
- B. Remove all existing fluorescent lamps and package to prevent breakage according to EPA Regulations. Ship the lamps to a licensed lamp recycling facility with an approved material handler.
- C. Furnish the Owner with a Certificate of Disposal for these lamps, indicating the number of lamps, time and location of disposal.

- D. Bear all cost for lamp recycling.

3.7 ELECTRIC SERVICE OUTAGE AND ENERGIZATIONS

- A. Owner Approval: Electric service outages or energizations required shall be approved by the Owner before outages or energization. Outages shall be scheduled at the convenience of the Owner.
- B. Written Request: Requests for outages and energizations shall be submitted in writing to the Owner for approval at the earliest possible date and in no case later than 14 days prior to the outage and/or energization.
- C. Cancellation: The Owner reserves the right to cancel or change the scheduling of any outage up to 24 hours before its approved starting time. There shall be no additional cost to Owner for scheduled outages, or for outages re-scheduled at the Owner's request where at least 24 hours' notice has been given by the Owner.
- D. Schedules: A minimum of two (2) weeks before the first outage, submit a schedule of proposed sequence of all the electric feeder and switchboard outages and energizations. This schedule shall show construction energizations and shall include any weekend work. The schedule shall list the work to be completed during and between each outage.
- E. Minimize all outages on the Owner's electrical system and employ sufficient workmen so that work will be carried on concurrently at more than one location, when necessary.
- F. Before submitting any energization and/or outage requests, provide the owner with evidence that the following requirements have been met:
 - 1. All required equipment and material is on the job site. All related installations that can be worked on without an energization and/or outage are complete, tested, available for inspection, and ready for service.
 - 2. All shop drawings, test reports, installation data, and operational data have been submitted and approved.
 - 3. The energizing and outage schedule has been submitted and approved.
- G. Similar outage procedures shall be followed for telecommunications and other services to the facility.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Copper building wire rated 600 V or less.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
 - 2. Unless indicated otherwise on plans, all wiring must comply with NFPA 70, Article 517 Health Care Facilities.

PART 2 PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alanwire
 - 2. Alpha Wire.
 - 3. American Bare Conductor
 - 4. Belden Inc.
 - 5. Cerro Wire
 - 6. Encore Wire Corporation.
 - 7. General Cable Technologies Corporation.
 - 8. Okonite Company (The)
 - 9. Service Wire Co.
 - 10. Southwire Incorporated.
 - 11. United Copper Industries.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. RoHS compliant.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Conductor Insulation:
 - 1. Type THHN and Type THWN-2: Comply with UL 83.
 - 2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

3. Type XHHW-2: Comply with UL 44.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. 3M Electrical Products
 2. AFC Cable Systems, Inc.
 3. Gardner Bender.
 4. Hubbell Power Systems, Inc.
 5. Ideal Industries, Inc.
 6. ILSCO
 7. NSi Industries LLC.
 8. O-Z/Gedney; a brand of the EGS Electrical Group.
 9. Service Wire Co.
 10. TE Connectivity Ltd.
 11. Thomas & Betts Corporation
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 1. Material: Copper.
 2. Type: One or Two hole with standard barrels.
 3. Termination: Compression.

PART 3 EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- E. Branch Circuits: Copper. Stranded for No. 12 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls: Type THHN/THWN-2, single conductors in raceway
- C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G. Group conductors with phases A, B, C, and neutral together in all conduits or raceways regardless of number of sets of conductors, conduits or raceway type.
- H. Do not install more conductors in a raceway than indicated on the drawings. A maximum of three branch circuits are to be installed in any one conduit, on 3 phase 4 wire system, unless specifically indicated otherwise on the drawings. No two branch circuits of the same phase are to be installed in the same conduit, unless specifically indicated on the drawings. Where the quantity of wires is not indicated on the drawings for branch circuits (2) #12 copper conductors shall be provided.
- I. Multipole circuit breakers shall not be used to feed multi-wire branch circuits – each circuit shall have separate and continuous neutral.
- J. Conductor size shall be a minimum of No. 12 AWG. Conductor size shall not be less than indicated on the drawings. The minimum size of emergency systems conductors shall be No. 10 AWG. 60 deg. C ampacities shall be used for sizing all wire and cable for feeders rated 100 amps and below. 75 deg. C ampacities shall be used for sizing of all wire and cable for feeders rated over 100 amps. This sizing requirement applies to all cables in these size ranges, including those with higher insulation ratings. Use No. 10 AWG for conductors in 120 volt 20 amp branch circuits longer than 100 feet (30 m), and in 277 volt 20 amp branch circuits longer than 200 feet (60 m).
- K. Do not use AC or MC for homeruns. Use conduit from last box in wall or ceiling back to panel.
- L. Do not use type AC or MC cable or flexible conduit as life safety or critical branch circuits in patient care areas.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.
- D. Stranded conductors shall have termination device crimped onto conductors prior to connection to outlet devices or installed with back-wired devices listed for stranded.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078400 "Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections:
 - 1. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
- D. Cables will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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. Metal conduits, tubing, and fittings.
 - 2. Boxes, enclosures, and cabinets.
- B. Related Requirements:
 - 1. Section 078400 "Firestopping" for firestopping at conduit and box entrances.

1.3 ACTION SUBMITTALS

- A. Product Data: For wireways and fittings.

PART 2 PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems, Inc.
 - b. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - c. Anamet Electrical, Inc.
 - d. Calconduit
 - e. Electri-Flex Company.
 - f. FSR Inc.
 - g. Korkap
 - h. Opti-Com Manufacturing Network, Inc.
 - i. O-Z/Gedney; a brand of EGS Electrical Group.
 - j. Perma-Cote
 - k. Picoma Industries, Inc.
 - l. Plasti-Bond
 - m. Republic Conduit.
 - n. Southwire Company.
 - o. Thomas & Betts Corporation.
 - p. Western Tube and Conduit Corporation.
 - q. Wheatland Tube Company; a division of John Maneely Company.
 - 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 3. EMT: Comply with ANSI C80.3 and UL 797.
 - 4. FMC: Comply with UL 1; zinc-coated steel or aluminum.
 - 5. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems, Inc.

- b. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - c. Anamet Electrical, Inc.
 - d. Calconduit
 - e. Electri-Flex Company.
 - f. FSR Inc.
 - g. Opti-Com Manufacturing Network, Inc.
 - h. O-Z/Gedney; a brand of EGS Electrical Group.
 - i. Perma-Cote
 - j. Picoma Industries, Inc.
 - k. Plasti-Bond
 - l. Republic Conduit.
 - m. Southwire Company.
 - n. Thomas & Betts Corporation.
 - o. Topaz Electric; a division of Topaz Lighting Corp.
 - p. Western Tube and Conduit Corporation.
 - q. Wheatland Tube Company; a division of John Maneely Company.
2. Comply with NEMA FB 1 and UL 514B.
 3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 4. Fittings, General: Listed and labeled for type of conduit, location, and use.
 5. Fittings for EMT:
 - a. Material: Steel or Zinc die cast.
 - b. Type: Setscrew or compression.
 6. EMT Fittings Materials:
 - a. All Zinc materials shall be ASTM B86 certified
 - b. All Zinc Product shall be ZAMAK #3 and/or #7 formula.
 - c. All Steel shall be SAE 1050.
 7. EMT Fittings Design:
 - a. Zinc die cast components shall be ball burnished.
 - b. Steel parts shall be zinc plated for corrosion protection.
 - c. All Locknuts shall have a dual, precision machined-cut thread, reversible and possess a serrated face on each side.
 - d. All set screw products shall be manufactured with a tri-drive head and staked or modified to prevent disassembly.
 - e. All fitting throat diameters shall be smooth with no sharp edges or slag.
 - f. Rain tight products shall have internal sealing rings to create and maintain a rain tight seal.
 - g. All fittings shall be tested per UL 514B and be listed by Underwriters Laboratories.
 8. Transition Fittings:
 - a. All transitions fittings (go-to or from-to fittings) or fittings used to transition from one raceway type to another must be UL listed for that application.

PART 3 EXECUTION

3.1 RACEWAY APPLICATION

- A. Indoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: EMT, ENT or RNC.
 2. Concealed in Ceilings and Interior Walls and Partitions: EMT, ENT or RNC.
 3. Connection to Vibrating Equipment (Including Transformers): FMC.
 4. Boxes and Enclosures: NEMA 250.
- B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel or Zinc die-cast metal fittings. Comply with NEMA FB 2.10 and UL514B.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Do not fasten conduits onto the bottom side of a metal deck roof.
- E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Do not install horizontal raceway runs above water and steam piping.
- F. Complete raceway installation before starting conductor installation.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. Support within 12 inches (300 mm) of changes in direction.
- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- L. Raceways Embedded in Slabs:
 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
- M. Stub-ups to Above Recessed Ceilings:
 1. Use EMT, IMC, or RMC for raceways.
 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

- R. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.
- W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel. Do not install boxes back-to-back.
- X. Locate boxes so that cover or plate will not span different building finishes.
- Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- AA. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- BB. Boxes installed in metal stud and sheetrock walls shall have far-side box support.
- CC. Boxes shall be secured to metal studs with spring steel clamp which wraps around the entire face of the stud and digs into both sides of the stud. Clamp shall be screwed into the stud.
- DD. Set outlet boxes for flush mounted devices to within 1/8" of finished wall.
- EE. Minimum box size to be two gang. For installation of single gang device use properly sized mud ring with thickness to install device within 1/8" of finished wall.
- FF. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

END OF SECTION

SECTION 26 27 26 WIRING DEVICES

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. Hospital-grade receptacles, 125 V, 20 A.
 - 2. Cord and plug sets.
 - 3. Toggle switches, 120/277 V, 20 A.
 - 4. Wall plates.

1.3 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
 - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
 - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
 - 3. Leviton: Leviton Mfg. Company, Inc.
 - 4. Pass & Seymour: Pass& Seymour/Legrand.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Provide coversheet indicating project title, project location, and vendor contact information.
 - 2. Organize submittal into logical sections and provide table of contents.
 - 3. Provide itemized bill of materials indicating model number and quantity for each product.
 - 4. On datasheets with multiple products, indicate which product is provided under this project.
 - 5. Combine electronic submittals into one unified PDF document that is organized per the table of contents. The submittal shall be free of copyrighted files and proprietary file formats. Electronic links may be submitted to supplement product datasheets, but may not be used as a substitute for product datasheets that are required to be included in the unified PDF submittal.
 - 6. Manufacturers' catalog sheets with complete technical data for each item being furnished.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.

- D. Comply with NEMA WD 1.
- E. Devices for Owner-Furnished Equipment:
 - 1. Receptacles: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.
- F. Device Color:
 - 1. Model numbers given in Part 2 do not include color designators. Refer to color listed here or as scheduled on drawings.
 - 2. Wiring Devices Connected to Normal Power System: Gray unless otherwise indicated or required by NFPA 70 or device listing.
 - 3. Wiring Devices Connected to Essential Electrical System: Red.
- G. Wall Plate Color: For plastic covers, match device color.
- H. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Eaton. (Arrow Hart is acceptable only where noted.)
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand (Pass & Seymour).

2.3 HOSPITAL-GRADE RECEPTACLES, 125 V, 20 A

- A. Hospital-Grade, Single Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Eaton; 8310.
 - b. Hubbell; 8310.
 - c. Leviton; 8310.
 - d. Pass & Seymour; 8301.
 - 2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Two pole, three wire, and self-grounding.
 - 3. Configuration: NEMA WD 6, Configuration 5-20R.
 - 4. Standards: Comply with UL 498 Supplement sd and FS W-C-596.
 - 5. Marking: Listed and labeled as complying with NFPA 70, "Health Care Facilities" Article.
- B. Hospital-Grade, Duplex Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Eaton; 8300S.
 - b. Hubbell; HBL8300.
 - c. Leviton; 8300.
 - d. Pass & Seymour; 8300.
 - 2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Two pole, three wire, and self-grounding.
 - 3. Configuration: NEMA WD 6, Configuration 5-20R.
 - 4. Standards: Comply with UL 498 Supplement sd and FS W-C-596.
 - 5. Marking: Listed and labeled as complying with NFPA 70, "Health Care Facilities" Article.
- C. Hospital-Grade, Duplex GFCI Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Eaton; SGFH20.
 - b. Hubbell; GFRST83.
 - c. Leviton; GFNT2-HG.
 - d. Pass & Seymour; 2097HG.

2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Single-piece, rivetless, nickel-plated, all-brass grounding system.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Non-feed through.
5. Standards: Comply with UL 498 supplement sd, UL 943 Class A, and FS W-C-596.
6. Marking: Listed and labeled as complying with NFPA 70, "Health Care Facilities" Article.

2.4 CORD AND PLUG SETS

- A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
- B. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
- C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 TOGGLE SWITCHES, 120/277 V, 20 A

- A. Single-Pole Switches
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Eaton; AH1221.
 - b. Hubbell; HBL1221.
 - c. Leviton; 1221-2.
 - d. Pass & Seymour; PS20AC1.
 2. Standards: Comply with UL 20 and FS W-S-896.

2.6 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Type 302 stainless steel 0.04-inch- (1-mm-) thick, brushed brass with factory polymer finish.
 3. Material for Unfinished Spaces: Galvanized steel.
- C. Antimicrobial Cover Plates:
 1. Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
 2. Tarnish resistant.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 8. Tighten unused terminal screws on the device.
 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- G. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- H. Exact field locations of floors, walls, partitions, doors, windows, and equipment may vary from locations shown on the drawings. Prior to locating sleeves, boxes and chases for rough-in of conduit and equipment, the contractor shall check with other contractors concerned, to determine exact field location of the above items. In addition, he shall check for exact direction of door swings so that local switches are properly located on the strike side.
- I. Where more than one wiring device occurs in any one location, arrange devices in gangs with common cover plate, excluding wall box dimmers. Where ganged switches serving 277V lighting are served by different circuits, so as to result in the voltage between switches exceeding 300V, provide barriers in box per NEC Section 404-8(b).
- J. In locations where several pieces of wall-mounted equipment such as wall switches and thermostats are in the same general area, all shall be installed and grouped in a neat, orderly fashion, all of the same horizontal or vertical center line, whichever the case may be. Variation from this direction shall be approved by the owner or the owner's representative. All receptacles and switches shall be mounted at a height as directed in drawings.
- K. Install devices, accessories, and assemblies level, plumb, square with building lines, and secure.
- L. Install Hospital Grade devices in all spaces excluding building support areas.
- M. Install tamper resistant devices in all corridors, Exam Rooms, public dining area, pediatric areas, psych/behavioral/holding, and general waiting rooms, or where children may be present.

- N. Install GFCI type receptacles where located in bathrooms, kitchens, garages, outdoors, or within six feet of a water source.
- O. Install GFCI type receptacles at all locations indicated as EWC (electric water cooler).
- P. Install GFCI type receptacles at all locations for vending machines.
- Q. Install GFCI type receptacle with an in-use weatherproof cover for all receptacles indicated as weatherproof.
- R. Devices mounted in boxes which are not flush with the surface of the wall shall be installed so that the mounting yoke or strap of the device is held rigidly at the surface of the wall, but not supported by the wall. Provide washers or spacers to fill in the area between the box and the finished wall line.
- S. Receptacles shall be installed so that the removal of the receptacle does not interrupt the continuity of the circuit.
- T. Receptacles and switches shall have their device screws covered by two wraps of PVC electrical tape. Receptacles with integral hinged plastic covers meet this requirement.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
- C. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- D. Essential Electrical System: Mark receptacles supplied from the essential electrical system to allow easy identification using a self-adhesive label.

3.4 FIELD QUALITY CONTROL

- A. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Perform the following tests and inspections:
 - 1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- D. Test straight-blade hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).
- E. Wiring device will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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. Molded-case circuit breakers (MCCBs).

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
- B. Shop Drawings: For enclosed switches and circuit breakers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include wiring diagrams for power, signal, and control wiring.
 - 3. Provide coversheet indicating project title, project location, and vendor contact information.
 - 4. Organize submittal into logical sections and provide table of contents.
 - 5. Provide itemized bill of materials indicating model number and quantity for each product.
 - 6. On datasheets with multiple products, indicate which product is provided under this project.
 - 7. Combine electronic submittals into one unified PDF document that is organized per the table of contents. The submittal shall be free of copyrighted files and proprietary file formats. Electronic links may be submitted to supplement product datasheets, but may not be used as a substitute for product datasheets that are required to be included in the unified PDF submittal.
 - 8. Manufacturers' catalog sheets with complete technical data for each item being furnished.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017800 "Closeout Submittals," include the following:
 - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. IBC 1708.5 Electrical equipment. Each manufacturer of designated seismic system components shall test or analyze the component and its mounting system or anchorage and submit a certificate of compliance for review and acceptance by the registered design professional in responsible charge of the design of the designated seismic system and for approval by the building official. The evidence of compliance shall be by actual test on a shake table, by three-dimensional shock tests, by an analytical method using dynamic characteristics and forces, by the use of experience data (i.e., historical data demonstrating acceptable seismic performance) or by more rigorous analysis providing for equivalent safety. The special inspector shall examine the designated seismic system and determine whether the anchorages and label conform with the evidence of compliance.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.2 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. In the emergency distribution system(s), provide devices to selectively coordinate with all supply side overcurrent protective devices.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB.
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.

- C. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- D. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Standards: Comply with UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- G. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- H. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- I. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I²t response.
- J. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- K. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- L. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.

2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- C. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- D. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- E. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than ten days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Owner's written permission.
 - 4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.

3.4 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with mounting and anchoring requirements specified in Section 260548 "Seismic Controls for Electrical Systems."
- C. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION