

UC DAVIS HEALTH

SPECIFICATIONS

FOR

PROJECT NO. A/C 9579140 **S230997-34-00**
MAIN HOSP Radiology CT Site Trailer Project

DATE: 9/29/2023 **10/04/2023**

SIGNATURES

REVIEWED IN ACCORDANCE WITH THE REQUIREMENTS OF T24, CCR

APPROVED

Donald W Harris, Senior Architect

October 04, 2023

Department of Health Care Access and Information
Office of Statewide Hospital Planning & Development

UNIVERSITY OF CALIFORNIA DAVIS MEDICAL

PROJECT NO. A/C 9579140

PROJECT NAME: MAIN HOSP Radiology CT Site Trailer Project
2315 Stockton Blvd, Sacramento CA, 95817

ARCHITECT

Stein Architects Inc.
6609 Folsom Auburn Road, Suite 200
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The Engineering Enterprise
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CERTIFICATION

Project No.: 9579140
Name of Project: MAIN HOSP Radiology CT Site Trailer Project

Project Manager: _____
Casey Lubawy Date

Bidding Documents Prepared By:

Name of Firm: Stein Architects Inc.
Address: 333 University Ave., Suite 200
City, State, Zip Code: Sacramento, CA 95825

Signed: _____
(Signature of an officer of the firm named above)

Typed Name: Jeffrey Paul Stein

Title: Architect of Record

Certification: *(Affix below professional registration stamp of the person named above with signature/expiration date.)*

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SECTION 01 11 00
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. University Furnished/University Installed Products
- F. Concurrent Work Under Separate Contracts
- G. Site Condition Survey and Protection of Existing Improvements
- H. **Contractor** Use of Site and Premises
- I. University Beneficial Occupancy (if applicable)
- J. Project Phasing (if applicable)

1.02 DESCRIPTION OF THE WORK

- A. Project is titled: MAIN HOSP Radiology CT Site Trailer Project
- B. University Project No.: 9579140
- C. Project is located at 4301 X St, Sacramento, CA 95817, UC Davis Health, Sacramento, California, as shown on the vicinity map.
- D. Project consists of the installation of a CT Mobile Unit (per HCAI PIN 34) located adjacent to the Old Emergency Room Expansion – Bldg 1 – HCAI BLD-05815 which includes new electrical service coming from the CT Scan Building – Bldg 15 – HCAI BLD-05815 and new data service coming from the East Wing (Tower) – Bldg 03 HCAI BLD-01436.
- E. A description of areas, types of construction and general nature of the Work are described on drawing A0.0
- F. Build-out as shown and herein specified, complete and ready for occupancy, the following renovated facility shown on the Contract Documents.
- G. Special Constraints and Criteria:
 - 1. Refer to Section 011400 Work Restrictions for dates and hours when the building

is occupied and operational, and work-shift hour requirements and restrictions.

2. Noise Mitigation shall be required when the building is occupied.
3. Egress shall not be restricted or impacted unless scheduled when the building is not occupied.

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 48 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 48 of the Contract.

1.05 UNIVERSITY-FURNISHED, CONTRACTOR-INSTALLED (UFCI) 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. CT Mobile Unit.

- 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 but not limited to: 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 013100 - COORDINATION for additional requirements.

1.06 UNIVERSITY-FURNISHED, UNIVERSITY-INSTALLED (UFUI) PRODUCTS

- A. University-Furnished Products: University will furnish and install products which may be identified on the Drawing and in the Specifications as UFUI (University-Furnished/University-Installed).
 - 1. Imaging and X-Ray Equipment will be furnished by the University.
 - 2. [List specific products to be furnished and installed by the University].
- B. Relationship to Work Under the Contract: Work under the Contract shall include all provisions necessary to provide all rough-in requirements into the Work, including as necessary but not limited to 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 013100 - COORDINATION for additional requirements.

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. 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 the right to back charge **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 a.m. to 5:00 p.m., 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 015100 - 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) calendar days' notice of all utility outages and shutdowns.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not applicable to this Section

END OF SECTION 01 11 00

SECTION 01 14 00

WORK RESTRICTIONS

PART I - GENERAL

1.01 WORK HOURS

- A. No Work shall be done outside of standard Monday through Friday 7:00 a.m. to 5:00 p.m. working hours, on holidays or weekends unless prior written approval has been retained from the University's Representative.
- B. Work Shifts and Work During Holidays and Weekends. (OMIT if Paragraph A is USED)
 - 1. The **CONTRACTOR** shall provide two work shifts 7:00 a.m. to 5:00 p.m. and 7:00 p.m. to 5:00 a.m. Each work shift shall use a different Superintendent at no additional cost to the University.
 - 2. The **CONTRACTOR** shall work Holidays and Weekends at no additional cost to the University.

1.02 PROJECT PHASING (NOT USED)

1.03 WORK SEQUENCE and WORK RESTRICTIONS (NOT USED)

1.04 **CONTRACTOR'S** USE OF PROJECT SITE

- A. **CONTRACTOR's** use of the Project site for the Work and storage is restricted to the areas designated on the Drawings.

1.05 UNIVERSITY OCCUPANCY (NOT USED)

1.06 SUBSTANTIAL COMPLETION

- A. Substantial Completion shall be applicable to the entire Work.

1.07 PROTECTION OF PERSONNEL

- A. Patients, University of California Davis (UCD) personnel and Students, will be occupying parts of the adjacent buildings during the construction period. **CONTRACTOR** shall take proper precautions to ensure the safety of all persons during the construction period.

1.08 WORK SITE DECORUM

- A. Extreme care to limit noise shall be taken at all times that the building is occupied. Loud or unnecessary conversation shall be avoided. The playing of radios, or any audio devices shall be strictly prohibited. Noise, that in the sole opinion of the University's

Representative, is disturbing or disruptive to occupants of the building shall be scheduled for periods when the building is not occupied.

- B. **CONTRACTOR** shall control the conduct of its employees so as to prevent unwanted interaction initiated by **CONTRACTOR**'s employees with UCD staff, patients, students or other individuals, adjacent to the Project site. Without limitation, unwanted interaction by **CONTRACTOR**'s employees includes whistling at or initiating conversations with passersby. In the event that any **CONTRACTOR**'s employee initiates such unwanted interaction, or utilizes profanity, **CONTRACTOR** shall, either upon request of University's Representative or on its own initiative, replace said employee with another of equivalent technical skill, at no additional cost to the University.

SMOKE AND TOBACCO-FREE ENVIRONMENT: The University of California Davis is committed to a healthy campus and workplace culture and environment. Effective January 2, 2014, the University of California Davis is a Smoke and Tobacco-Free environment. Smoking and the use of smokeless tobacco products (e.g., e-cigarettes and other unregulated nicotine products) is strictly prohibited on all University of California Davis-controlled properties, owned or leased and regardless of location. This policy is intended to provide a healthier, safer, and productive work and learning environment for the entire University of California Davis community. For more information on the Smoke/Tobacco-Free Policy, please visit (<http://breathefree.ucdavis.edu>). For more information on the President's Mandate and other related resources, please visit <http://uctobaccofree.com/>.

- D. Alcoholic beverages are prohibited on the University's Project site.

1.09 INTERRUPTION OF BUILDING SERVICES

- A. Planned utility service shutdowns shall be accomplished during periods of minimum usage. In some cases, this will require Work activities before 8:00 a.m. and after 5:00 p.m. and weekend Work, at no additional cost to the University. At least 14 calendar days advance notice shall be given to the University's Representative before interruptions to utility service (refer to Utility Service Interruption/Shut Down Request) and other interferences with use of existing buildings, surrounding hardscape and roads.
- B. Shutdowns critical to the completion of the project shall be listed as Milestones on the project schedule. The **CONTRACTOR** shall program Work so that service will be restored in the minimum possible time and shall cooperate with the University in reducing shutdowns of utility systems.
- C. The University reserves the right to deny shutdown requests based on scheduled workload, research projects, and usage of surrounding buildings or other activities planned on campus.
- D. University's costs for initial planned utility service shutdowns shall be borne by the University. If repeat utility service shutdowns are required due to work necessary to correct **CONTRACTOR**'s defective work, mistakes in new work layout such as misalignment or installation conflicts with other new work, University's costs for repeat shutdown(s) will be deducted from Contract Sum.

1.10 SITE INGRESS AND EGRESS

- A. Access to Project site shall be as indicated on the Drawings. Access to Project site is limited to designated routing on existing access roads. The **CONTRACTOR** and their

employees, sub **CONTRACTORS**, suppliers or delivery personal must stay on the designated roads and may not drive, ride or walk to other locations unless prior permission is provided in writing by the University's Representative.

- B. **CONTRACTOR** shall take all necessary precaution to ensure the safety of the bicyclists and pedestrians that use the campus roads.
- C. **CONTRACTOR** shall clean the site access and roads affected by the Work and shall maintain such in a dust free and safe and usable condition for motorists, bicyclists and pedestrians. During inclement weather **CONTRACTOR** shall closely monitor conditions to prevent slickness of roads.
- D. **CONTRACTOR** shall be permitted to block only 1/2 of a street at a time for momentary site access, unless specified otherwise. The street shall be operational and usable by the University at all times.

1.11 MOTOR VEHICLE AND BICYCLE TRAFFIC CONTROL

- A. **CONTRACTOR** shall adopt all practical means to minimize interference to traffic. Access to other facilities in the area shall be maintained at all times. The **CONTRACTOR** shall provide a schedule of any activity that will impact traffic, or any planned lane or street closure, for approval by the University's Representative and shall give a minimum of 14 business days notice before closing any street or access.
- B. **CONTRACTOR** shall furnish at **CONTRACTOR's** expense all signage barricades, lights, and flaggers required to control traffic and shall provide and maintain suitable temporary barricades, fences, directional signs, or other structures as required for the protection of the public; and maintain, from the beginning of twilight through the whole of every night on or near the obstructions, sufficient lights and barricades to protect the public and Work.
- C. **CONTRACTOR** shall provide directional signs for use throughout the duration of the Project. The quantity shall be determined by the University's Representative and **CONTRACTOR** during a mandatory Pre-construction site meeting. **CONTRACTOR** shall prepare a mock-up of the sign for approval by the University's Representative.
- D. It is the responsibility of the **CONTRACTOR** performing Work on, or adjacent to, a roadway or highway to install and maintain such devices which are necessary to provide reasonably safe passage for the traveling public, including pedestrians and bicyclists, through the Work, as well as for the safeguard of workers. Before Work begins, a site meeting shall be held to discuss motor vehicle and bicycle traffic control plans for handling traffic through a construction or maintenance zone. Traffic control plans shall be submitted for review by the University's Representative and public agency or authority having jurisdiction over the roadway or highway. These traffic control plans shall be prepared by persons knowledgeable about the fundamental principals of temporary traffic controls and the work activities to be performed. The design, selection, and placement of traffic control devices for the traffic control plan shall be based on engineering judgment and in accordance with Part 6 of the California Manual on Uniform Traffic Control Devices for Streets and Highways.

- E. All metal plating and metal bridging shall be non-skid with waffle-patterns or right-angle undulations or shall be coated with a non-skid product. Plating shall be installed with no protruding edges or corners sticking up and with no bouncing or shifting.

PART II - PRODUCTS – Not applicable to this Section.

PART III - EXECUTION – Not applicable to this Section.

END OF SECTION 01 14 00

SECTION 01 25 00

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 016100 – 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, or electronic and/or web-based construction administration software provided or accepted by the University.

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 RFIs 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. Email the University's Representative the RFIs. Emailed RFI requests received after normal business hours and/or received on non-normal workdays, as defined in Specification Section 013100–COORDINATION, Item 1.07.F.4.A will begin notification time starting at 7:00 a.m. the following workday.
- B. Failure to provide proper information: RFIs 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) calendar 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.
- 3.02 Refer to the following Attachment
- A. Request for Information

END OF SECTION 01 25 00

REQUEST FOR INFORMATION

Project #: _____ Project Title: _____
RFI #: _____ Date: _____ HCAI #: _____

UC Davis Health Facilities Design & Construction 4800 2nd Avenue, Suite 3010, Sacramento, CA 95817 Attn.: Casey Lubawy C: 916-612-3617 Email: calubawy@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 UNIVERSITY'S FD&C PROJECT MANAGER IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

COPIES: University CONSULTANTS _____ FILE

SECTION 01 25 50

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. Cost Proposals and Supporting Documentation
- I. Execution of Change Orders
- J. 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 01 25 00 – CLARIFICATION/INFORMATION PROCEDURES
- C. Section 01 29 00 – MEASUREMENT AND PAYMENT: Applications for Payment.
- D. Section 01 61 00 – PRODUCT REQUIREMENTS: Product options, substitutions, omissions, and improper descriptions.
- E. Section 01 77 00 – CLOSEOUT PROCEDURES: Project record documents.

1.03 DEFINITIONS

- A. Total Wage Rate: Base rate paid to the worker, including his/her fringe benefits, workman's compensation insurance and subsequent payroll taxes paid by the employer.
 - 1. Use Wage Rate Calculator issued with Division One.
 - 2. Projects in the University Controlled Insurance Program (UCIP) should not include workman's compensation in the wage rates.

- B. Consumables: Material purchased in bulk and not expressly accounted for in the listed materials on a change order request. These include but are not limited to, rags, washers, screws, nuts, small bolts, lubricants, cleaning materials, pens, chalk, pencils, tie wire, caution tape, etc. Compensation for consumables shall be incorporated as a 3% percentage increase on direct material costs for trades where these items are routinely used.
- C. Non-working Supervision: Non-working supervision is not allowed to be included on a change order per GC article 7.3.3.

1.04 SUBMITTALS

- A. Submit the items listed below prior to submitting the 2nd Application for Payment.
 - 1. Total Wage Rates: Provide a wage rates for each key worker of the General Contractor and all Subcontractor tradespeople using the University's digital form for review and in compliance with the general conditions article 7 for approval by the University. Approved rates will be used in the Exhibit 7 Labor Rate Breakdown forms submitted with each Cost Proposal.

1.05 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. Exhibit 7 of the Contract includes the following Forms:
 - 1. COST PROPOSAL Form
 - 2. SUPPORTING DOCUMENTATION FOR THE COST PROPOSAL SUMMARY Form
 - 3. CHANGE ORDER Form
 - 4. REPORT OF SUBCONTRACTOR INFORMATION Form

1.06 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.

1.07 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) calendar 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 016100 – PRODUCT REQUIREMENTS.

1.08 FIELD ORDER

- A. Field Order: University's Representative may issue a Field Order, signed by University's Representative, instructing the **Contractor** to proceed immediately 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 indicated in the Field Order prior to acceptance of a Cost Proposal for the Work by the University.
- 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.

1.09 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 CONTENT OF COST PROPOSALS

- A. Cost Proposals shall include the following:
1. Detailed description of the work involved including:
 - a. What work is being performed?
 - b. Where the work is performed?
 - c. When the work was performed if already completed?
 - d. When the work is scheduled to be performed if not yet completed?
 - e. Why this work is a change to the contract?
 2. Detailed description of any time impacts associated with the work; refer to General Conditions, paragraph 8.4.
 3. Materials
 - a. Material shall be submitted at the cost paid by the contractor.
 - 1) Invoices may be required to validate that meet the following criteria:
 - a) Invoices may be from different projects if the following conditions are met:
 - (1) The COR is before the contractor would reasonably have the material on site to accomplish the COR.
 - (2) Recent, within last 6 months.
 - (3) There must be at least enough of the material in question to accomplish the work in the proposed COR.
 - b) The invoice shall not be modified from the version provided by the vendor.
 4. Labor unit breakdown backed up by some sort of industry standard (NECA for electrical, MCAA for plumbing and mechanical, SMACNA for mechanical, Etc.) These standards shall be used at their base rate, with no added percentages nor adjustments. This has been found to be a fair representation of the man-hours required to do these types of work.
 - a. This project has been determined as NECA normal.

5. Wage rate back up matching the submitted back up as described in 1.03.A.
- B. Submittal of a Cost Proposal using the Cost of the Work plus Contractor Fee described in General Conditions paragraphs 7.3.5 and 7.3.6 shall include the following items in addition to those listed above:
1. Field Order instructing the change. Only a field order may instruct work to be completed using this basis.
 2. Material invoices shall be provided for any item used in Extra Work.
 3. Job site work tags identifying daily labor and material usage shall be submitted with:
 - a. Specific description of the work performed on that tag.
 - b. Identification of large equipment used
 - c. Identification of labor class for each individual
 - d. Location - room number, gridline or distinct location.
 - e. Signed by the Contractor and University's Representative.
- C. Any coordination required for implementation of a change into the work, documents, or model is and shall be considered part of the allowable markups provided in General Conditions paragraphs 7.3.3.1-18 and 7.3.4.

3.02 EXECUTION OF CHANGE ORDERS

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

3.03 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 01 25 50

SECTION 01 29 00
MEASUREMENT AND PAYMENT

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and presentation of Application for Payment.
- B. Procedures for preparation and presentation of Schedule of Values.

1.02 RELATED DOCUMENTS AND SECTIONS

- A. GENERAL CONDITIONS of the Contract: Progress Payments and Final Payment.
- B. Section 013200 – CONTRACT SCHEDULES
- C. Section 017700 – CLOSEOUT PROCEDURES
- D. Section 017800 – CLOSEOUT SUBMITTALS

1.03 PAYMENT APPLICATION FORM

- A. Payment Application Form: Prepare Applications for Payment using Exhibit 4 provided in the Contract.

1.04 SCHEDULE OF VALUES

- A. Coordination. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Contract Schedule and as directed by the University's Representative.
 - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
 - a. Contractor's Contract Schedule.
 - b. Application for Payment form.
 - c. List of Subcontractors.
 - d. List of products (where/if appropriate).
 - e. List of principal supplier and fabricators.
 - f. Submittal Schedule
 - g. Construction Cost Breakdown Sheet.

2. Submit the Schedule of Values to the University's Representative at the earliest feasible date, but in no case later than 7 calendar days before the date scheduled for Submittal of the Initial Application for Payment.
- B. Format and Content. Use the Specification Table of Contents as a guide to establish the format for the Schedule of Values.
1. Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of the University's Representative.
 - c. Project Number.
 - d. Contractor's name and address.
 - e. Date of Submittal.
 2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
 - a. Generic name.
 - b. Performance Specification or University Specification section.
 - c. Name of Subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier (if appropriate).
 - f. Change orders (number) that have affected value.
 - g. Dollar value. (Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.)
 3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.
 4. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
 5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the

materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

- a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
6. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. **Contractor's** General Conditions overhead and profit shall be a separate line item per month.
8. Allowances (if applicable). Show the line item value of allowances.

1.05 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 in PDF electronic file on the required forms. Media-driven forms are acceptable.
 2. Execute certification by verified electronic 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 percentage complete with Progress Schedule.
 - e. Provide separate line items for each area of work such as but not limited to floors, zones, wings, or other areas that can be clearly identified.
 - f. 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.
 6. Refer to 1.05 for other items required for the Application for Payment.
- B. Final Payment: Prepare Application for Final Payment as specified in Section 017700 – CLOSEOUT PROCEDURES.

1.06 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) PDF electronic file of each Application for Payment with verified electronic signature, such as DocuSign. 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 013200 – CONTRACT SCHEDULES.
 3. Submit one (1) PDF electronic file of Schedule of Values in accordance with the General Conditions of the Contract. Form and content shall be acceptable to the University. Transmit under PDF electronic transmittal letter. Identify University's Project Name and University's Project Number.
 - 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. Each value will be based on a percent complete of that line item.
 - b. For each major subcontract, list products and operations of that subcontract as separate line items.
 - c. Coordinate listings with Progress schedule. **Contractor** project General Conditions plus overhead and profit shall be a separate line item in the Application for Payment; and be divided in an equal amount for each month part of the Contract Time period.
 - 1) At 50 percent completion of the work, or at other times the University's Representative deems appropriate, the University's Representative may request the monthly amount of overhead and profit be adjusted, if the contract schedule indicates going beyond the Contract End Date.

- d. For items on which payments will be requested for on-site stored products, list sub-values for cost of on-site stored products with taxes paid. If stored products are not on-site, they must be stored in a bonded warehouse or location approved by the University's Representative prior to including on the Application for Payment.
 - e. Submit a sub-schedule for each separate Phase of Work specified in Section 011100. Include scheduling of sequences within each phase indicated on the drawings.
 - f. The Sum of values listed shall equal total Contract Sum.
 - g. When University's Representative requires substantiating information, submit data justifying line-item amounts in question.
 - h. Provide one (1) PDF electronic file 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 PDF electronic transmittal letter. **Contractor** shall identify all payment application documents by University's Project Name and University's Project Number.

1.07 SUBSTANTIATING DATA

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

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01 29 00

SECTION 01 31 00
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 011100 – SUMMARY OF THE WORK: Description of Contract Documents.
- B. Section 013200 – CONTRACT SCHEDULES
- C. Section 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- D. Section 013500 – SPECIAL PROCEDURES: Interim Life Safety Measures (ILSM).
- E. Section 014500 – QUALITY CONTROL
- F. Section 014550 – INSPECTION AND TESTING OF WORK
- G. Section 015100 – TEMPORARY UTILITIES
- H. Section 015200 – CONSTRUCTION FACILITIES
- I. Section 015500 – VEHICULAR ACCESS AND PARKING: Traffic Regulation.
- J. Section 015600 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS
- K. Section 015610 – AIRBORNE CONTAMINANTS CONTROL
- L. Section 016100 – PRODUCT REQUIREMENTS
- M. Section 017300 – CUTTING AND PATCHING
- N. Section 017700 – CLOSEOUT PROCEDURES: Coordination of completion reviews, inspections, and submission of documents.

- O. Section 017800 – CLOSEOUT SUBMITTALS: As-Built Documents.
- P. Division 21 - Fire Protection Systems.
- Q. Division 28 - Fire Alarm Systems

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) calendar 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 013100 – COORDINATION.
 - b. Subcontractors List: Provide PDF electronic file. Distribute and discuss list of subcontractors and suppliers.
 - c. Construction Schedule: Provide per Section 013200. Distribute and discuss initial construction schedule and critical work sequencing of major elements of Work, including coordination of University furnished/**Contractor** installed (UFCI) products, University furnished/ University installed (UFUI) 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, electronic 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: Provide per Section 013300 and Section 016100. Review administrative procedures for shop drawings, project data and sample submittals and review of preliminary submittals schedule.

- i. Project As-Built Documents: Provide per Section 017700 and Section 017800. Review requirements and procedures for project as-builts, specifications and other documents.
 - j. Construction Facilities and Temporary Utilities: Provide per Section 015100 and Section 015200. 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 and UFUI products).
 - l. 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: Provide per Section 014550 and other sections of the Contract. 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.
 - o. Hours of Work and Work Restrictions per Section 011400.
 - p. Hot Works Permit.
- 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. Prior to the Billing Meeting the **Contractor** will submit a draft of the Application for Payment for review by the IOR and University Representative.
- 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 an electronic file within four (4) workdays 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) UFCI and UFUI products.
 - 5) Request for Information
 - 6) Safety Issues
 - 7) Scheduling Status/1 Week Prior and 32 Week Look Ahead
 - 8) Potential Schedule Delay Issues
 - 9) Incomplete or Non-Conforming Work
 - 10) Inspection Requests
 - 11) Utility Shutdowns and Dig Notifications
 - 12) Instructional Bulletins and Field Orders
 - 13) Change Orders/Cost Proposals
 - 14) Payment Applications and As-Built Documents
 - 15) Miscellaneous Business
 - 16) 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 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES, Section 017700 – CLOSEOUT PROCEDURES and Section 017800 – 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.
- B. Coordination/Engineering Drawings: Submit in accordance with Section 013300 – 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 017700 – 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 [enter specific number of calendar days] to move University equipment and/or provide furnishings in [specify area]. **Contractor** shall notify University's Representative in writing a minimum of fourteen (14) calendar days prior to completion of area described above.
 1. **Contractor** shall show this time as a distinct activity on the detailed project schedule.
- 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) calendar days prior to desired digging activity.
 2. The [**Contractor**][**CM/ Contractor**] shall contact USA North 811 prior to starting underground Work to locate existing underground utilities.
 3. **Contractor** shall mark locations of all known utilities on ground of dig area with marker paint.
 4. 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.
 5. **Contractor** shall verify with University's Representative that all interested hospital departments have been notified of intent to begin digging operation.
 6. 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 back charge 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 shut down.
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) calendar 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 the 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 a.m. and after 5:00 p.m. 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: Refer to Section 017600. 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 be submitted as a PDF electronic file with Table of Contents indexed. 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: **Contractor** shall provide a complete set of Coordination/ Engineering Drawings that indicates the architectural and structural building components; and combines all piping, conduits, fire sprinkler system, equipment, hangers, braces and other building components into one composite drawing for each floor, wing or area of work. Submit the Coordination/ Engineering Drawings as a bookmarked PDF electronic file. 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 ¼" = 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 above and below ceiling spaces for new and existing conditions, including bottom of all ducts, plenum, pipe and conduit elevations. Drawings shall show all structural and architectural components, restraints and other obstructions that may affect the work. Electronic or photo reproduction of University's Architectural Drawings is not acceptable.

- b. **Contractor** and each Subcontractor shall ensure all relevant mechanical and electrical equipment, piping, conduit, fire sprinkler system, ceiling hangers, braces etc., are shown and will fit, together with necessary items such as lights, ducts, fans, pumps, piping, conduit and the like.
- c. **Contractor** shall indicate all locations of expansion/ seismic joints and indicate how expansion for piping, conduit and other components is provided.
- d. **Contractor** shall indicate all locations for access doors or other means of access at conditions above and below for items requiring access or service including but not limited to valves, mechanical equipment, electrical equipment valves and other components. The **Contractor** is responsible that piping, conduit, braces and other obstructions do not block access to items indicated above.
- e. Submit completed and fully coordinated PDF electronic indexed file drawings with bookmarked Sheet Index together with **Contractor's** comments indicating possible areas of conflict for review to University's Representative prior to start of work.
- f. 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. PDF electronic files to applicable trades and University's Representative.
- g. Completion of work: All coordination drawings shall be submitted together with record (as built) drawings of all trades involved in accordance with Section 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 Refer to the following attachments

- A. Request for Shutdown (RFS) Info/Impact Report
- B. Dig Notification Form

END OF SECTION 01 31 00

REQUEST FOR SHUTDOWN (RFS) INFO/IMPACT REPORT

PROJECT NAME: _____

UNIVERSITY RFS# _____

PROJECT #: _____ HCAI #: _____ 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	FROM: _____ _____ _____ _____ _____
Project Manager's email address: calubawy@ucdavis.edu	_____

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 #: _____ HCAI#: _____ DATE: _____

TO: UC DAVIS HEALTH Facilities Design & Construction 4800 2 nd Avenue, Suite 3010 Sacramento, CA 95817 P: 916-734-7024	FROM: _____ _____ _____ _____ _____
Project Manager's email address: calubawy@ucdavis.edu	

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: _____

UNIVERSITY USE ONLY		
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:	University _____	Consultants _____ File _____

SECTION 01 32 00

CONTRACT SCHEDULES

PART I - GENERAL

1.01 SCOPE

- A. Preliminary Contract Schedule, Contract Schedule, updated Contract Schedules, Short Interval Schedules (SIS), Recovery Schedules and As Built Schedule.
- B. Sub-networks of activities (Fragnets) supporting Time Extension Requests.

1.02 DEFINITIONS

- A. Construction Schedule/CPM Schedule/Schedule: The most recent; Baseline Schedule, Updated Schedule or Revised Schedule.
- B. Final Baseline Schedule: A final and ongoing Schedule for the project that has been reviewed and accredited by the University's Representative
- C. Critical Work activities are defined as Work activities that, if delayed or extended, will cause a critical delay as defined in General Conditions Article 8. All other Work activities are defined as non-critical Work activities and are considered to have float.
- D. Float is defined as the time that a non-critical Work activity can be delayed or extended without causing a critical delay as defined in General Conditions Article 8. Neither the **Contractor** nor the University shall have an exclusive right to the use of float. Float is a shared resource available to each party to the contract. The **Contractor** shall document the effect of the use of float on the updated Contract Schedule.
- E. Recovery Schedule: Schedule required when any Revised Schedule or Update Schedule shows the work to be more than 14 calendar days behind the latest University-accepted contract end date
- F. Short Interval Schedule (SIS): Schedule prepared on a weekly basis demonstrating the work accomplished the prior week and work planned for the upcoming three weeks.

1.03 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 Shop Drawings, Product Data, Samples:
 - 1. Proposed Scheduling Software and qualifications of individual preparing schedules.
 - 2. Preliminary Contract Schedule
 - 3. Contract Schedule including graphical and tabular reports.

4. Monthly Updates to Contract Schedule, including Narrative Report.
 5. Short Interval Schedules
 6. Final As-Built Schedule
- B. Include an electronic version of all submittals required by this specification, including Narrative prepared in MS Word or .pdf format, CPM schedule in .xer file (P6 backup) or other schedule native file format if accepted under 1.3. A.1 above, .pdf of full schedule, and .pdf of critical path. The following fields shall be included:
1. Activity identification
 2. Activity description
 3. Duration, start, and finish dates.
 4. Percentage of completion
 5. Total float
 6. Responsible party
 7. Predecessors and successors

PART II - PRODUCTS

2.01 SOFTWARE

- A. The **Contractor** shall use Primavera P6 by Oracle Corporation, or equal to produce the schedule and all required graphical and tabular reports.

PART III - EXECUTION

3.01 PRELIMINARY CONTRACT SCHEDULE

- A. Within 10 calendar days after the Notice of Selection as the Apparent Lowest Responsible Bidder, **Contractor** shall submit the Preliminary Contract Schedule in both native and .pdf format to the University's Representative for acceptance. The Preliminary Contract Schedule shall represent the **Contractor's** plan for accomplishing the work within the Contract time showing all significant milestones for the Contract period as well as a detailed work plan for the first 90 calendar days following the Notice to Proceed. This detailed work plan shall identify in detail the following activities for the first 90 calendar days:
1. Preparation of equipment and material submittals for review. List Project submittals within Schedule per each specification section including Division 1 requirements. Indicate dates for submission of required submittals. Note: schedule shall include 18 calendar days for the University's review of the Preliminary Contract Schedule.
 2. Make submissions within the following number of days after the Notice to Proceed:

- a. Items needed in initial stages of Work or requiring long lead-time for ordering: 30 calendar days.
 - b. Deferred approval submittals, for review and approval by agencies such as University's when required: 60 calendar days.
 - c. Electrical, mechanical and equipment items other than those covered by item "a" above: 60 calendar days.
 - d. All other items: 90 calendar days.
3. Procurement schedule.
 4. Critical Path for the first 90 calendar days.
- B. The Preliminary Contract Schedule shall acknowledge significant known constraints and include all anticipated activities prior to the Notice to Proceed.
- C. The Preliminary Contract Schedule shall not include any actual dates or progress measured against any activities.
- D. Acceptance of the Preliminary Contract Schedule is a condition for approval of the first progress payment application.
- E. The **Contractor's** progress shall be measured against the Preliminary Contract Schedule until such time as the University accepts the **Contractor's** first Contract Schedule. The Preliminary Contract Schedule shall be incorporated into the **Contractor's** proposed Contract Schedule.
- F. Unless approved by the University's Representative, there shall be no activities shown with durations greater than 14 calendar days (excluding submittals, submittal reviews, and procurement activities).
- 3.02 CONTRACT SCHEDULE (BASELINE)
- A. The Contract Schedule shall represent a practical plan to fully complete the Contract within the Contract Time. The Contract Schedule shall include a complete sequence of construction, in adequate detail for coordination of the Work and shall be coordinated with the preparation of the Schedule of Values per 01 29 00 Measurement and Payment.
- B. Form
1. The proposed first contract schedule shall be produced using CPM (Critical Path Method) techniques, in the PDM (Precedence Diagram Method) method of scheduling. The Contract Schedule shall be calculated using the Retained Logic method. Progress override calculations shall not be acceptable. The schedule shall not use negative float or constraints on work activities.
 2. The Contract Schedule shall identify all holidays and non-working days.
 3. Identity of the party responsible for the activity (i.e., University, General **Contractor**, specific subcontractor, etc.)

4. The Contract Schedule activities shall be coded with the following information applicable to each activity:
 - a. Area of the project
 - b. Identity of the party responsible for the activity (i.e., University, General **Contractor**, specific subcontractor...)
 - c. Specification section applicable to activity
 - d. Phase
 - e. Sequence – The following sequences shall be identified:
 - 1) Administrative
 - 2) Submittal and Review
 - 3) Fabrication
 - 4) Construction: including phasing and sequencing as identified in 011400 Work Restrictions
 - 5) Inspection, Commissioning, and Close-out

C. Content

1. The Contract Schedule shall identify all Work activities in correct sequence for the completion of the Work within the Contract Time. Work activities shall include the following:
 - a. Major **Contractor**-furnished equipment, materials, and building elements, and scheduled activities requiring submittals or University's Representative's prior acceptance.
 - 1) Show dates for the submission, review, and approval of each such submittal. Dates shall be shown for the procurement, fabrication, delivery, and installation of major equipment, materials, and building elements, and for scheduled activities designated by the University.
 - 2) The schedule shall allow submittal review time in accordance with Section 01 33 00 Shop Drawings, Product Data, Samples.
 - b. System test dates.
 - c. Scheduled overtime Work to the extent permitted by Contract Documents.
 - d. Dates **Contractor** requests designated workspaces, storage area, access, and other facilities to be provided by the University.
 - e. Dates **Contractor** requests orders and decisions from the University on

designated items.

- f. Dates **Contractor** requests University-furnished equipment.
 - g. Dates **Contractor** requests University-furnished utilities.
 - h. Planned dates for shutdown, connection and relocation of existing utilities.
 - i. Planned dates for connecting to or penetrating existing structures.
 - j. Planned dates for scheduled inspections as required by Codes, or as otherwise specified.
 - k. Commissioning Sequence and activities for all Building Systems.
- 2. Unless approved by the University's Representative, there shall be no activities shown with durations in excess of 7 calendar days (excluding submittals, submittal reviews, and procurement activities). Milestones should be listed for the completion of wings, floors, and other similar areas.
 - 3. The allowable monthly rain days per the Supplemental Conditions shall be incorporated into the Schedule.
 - 4. Identify types of calendars used and the logic of their application.

D. Submission

- 1. The first Contract Schedule shall be submitted to the University not later than 30 calendar days after Notice to Proceed. The period covered by Contract Schedule shall be the Contract Time as specified in the Notice to Proceed. The Contract Schedule shall incorporate the logic of the Preliminary Contract Schedule covering the first 90 calendar days following the Notice to Proceed. Items to be included with first submission:
 - a. Contract Schedule (Baseline)
 - b. Critical Path Schedule excluding all non-critical Work activities.
 - c. Narrative
- 2. Tabular Computer Reports
 - a. As requested by the University, the **Contractor** shall submit various computer-generated tabular reports.
 - b. As requested by the University's Representative, the **Contractor** will be required to submit additional Schedule Reports.

E. Acceptance

- 1. Upon receipt, the University's Representative shall review the proposed first

Contract Schedule. Within 21 calendar Days of the University's receipt of the proposed first Contract Schedule, the University's Representative shall schedule a review meeting with the **Contractor** for the purpose of jointly reviewing the proposed first Contract Schedule.

2. If the proposed first Contract Schedule is accepted by the University's Representative, it shall become the Contract Schedule (or Baseline Schedule). Such acceptance shall not relieve **Contractor** from its responsibility to fully complete the Contract within the Contract Time, nor shall it relieve **Contractor** from sole responsibility for any errors in the Contract Schedule.
3. If the **Contractor** or the University's Representative determines the proposed first Contract Schedule to need revision, the **Contractor** shall revise and resubmit the proposed first contract schedule to the University's Representative within 14 calendar days for acceptance. If accepted, it shall become the Contract Schedule. Such acceptance shall not relieve **Contractor** from its responsibility to fully complete the Contract within the Contract Time, nor shall it relieve **Contractor** from sole responsibility for any errors in the Contract Schedule. If not accepted the **Contractor** will resubmit within 10 calendar days for a new review period to start.
 - a. No progress payment beyond the second progress payment will be paid to the **Contractor** until such time as the University's Representative has approved the **Contractor's** first proposed Contract Schedule.

F. Schedule Logic

1. Activity schedule logic should normally be of Finish-to-Start relationship type and assembled to show order in which **Contractor** proposes to carry out the Work. The logic should indicate restrictions of access, availability of Work areas, and availability and use of manpower, materials, and equipment. Form basis for assembly of schedule logic on the following criteria:
 - a. Indicate which activities must be completed before subsequent activities can be started.
 - b. Indicate which activities can be performed concurrently.
 - c. Indicate which activities must be started immediately following completed activities.
 - d. Indicate resource sequencing due to availability or space restrictions.
 - e. Lags shall not be used if can be represented with additional schedule detail. Finish-to-start logic ties with positive lags are not permitted. All positive time consumption should be represented by a schedule activity. Start-to-start, or finish-to-finish logic ties with negative lags are not permitted.
 - f. Lags in Start-to-Start or Finish-to-Finish relationships must not exceed the duration of the predecessor or successor activity, respectively.

G. Non-Sequestering of Float

1. **Contractor** shall not sequester float through scheduling techniques, including, but not limited to, constrained dates, extending Work Activity duration estimates, using preferential logic, such as lag or negative lag (lead), unless specifically requested in writing and approved by University's Representative. It is acknowledged that University-caused or **Contractor**-caused time savings to Activities on, or near, the critical path will increase float, such increase in float shall not be for the exclusive use or benefit of either University or **Contractor**.

H. Out of Sequence Logic:

1. Resolution of conflict between actual work progress and schedule logic: When out of sequence activities develop in Schedule because of actual construction progress, **Contractor** shall submit revision to schedule logic to conform to current status and direction and include reasons in schedule update Narrative.

I. Preferential Logic:

1. The intended purpose of scheduling on a construction project is to help ensure that **Contractor's** work on the project is adequately planned, tracked and managed. A construction schedule can be as simple as a list of activities, organized in a logical sequence, and time scaled. The concept of construction scheduling is to see that all activities necessary to complete the work, in accordance with the contract documents requirements, are properly planned, coordinated and managed. When **Contractor's** schedule activities are not sequenced in the most logical manner, but rather, in a manner as to create the maximum possible opportunity for University interference to claim delay or interruption, the University will reject the schedule with a request of different sequence of activities.

3.03 EXPERIENCE REQUIREMENTS

- A. **Contractor** shall designate an individual from **Contractor's** staff or a consultant who shall be responsible throughout the duration of the project for preparation of all schedules and reports as required by this specification. This individual shall also be required to attend all meetings with the University's Representative as required by this specification. The **Contractor** shall demonstrate to the satisfaction of the University that the individual or consultant has at least 3 years of experience preparing, maintaining, and administering detailed project schedules on projects of the same or similar size and complexity as this project. The **Contractor** shall also demonstrate to the satisfaction of the University that the individual or consultant is proficient in the use of the scheduling software proposed for use by the **Contractor** on this project.
- B. Within 14 calendar days after the Notice of Selection as the Apparent Lowest Responsible Bidder, **Contractor** shall provide the University with the identification, qualifications, and experience of and references for the proposed individual or consultant.

3.04 MONTHLY UPDATES

- A. After acceptance of the first proposed Contract Schedule, **Contractor** shall update the Contract Schedule monthly. The update shall reflect progress as of the end of each month. **Contractor** shall submit monthly schedule update to the University's Representative for acceptance with the draft payment application and no later than the tenth day of the following month. The updates shall be made as follows:

1. The Monthly updates shall report progress based upon percent complete of each activity or remaining duration. Actual start dates shall be recorded for those activities that have started. Actual finish dates shall be recorded for those activities that are completed. Activities that are in progress shall reflect an actual start date and the percentage completion for the activity. Actual dates shall be clearly distinguishable from projected dates.
 2. The updated Contract Schedule shall reflect an up-to-date status of the contract work as completed, and materials furnished and in permanent place that qualify for payment.
 3. The updated Contract Schedule shall reflect Contract Time changes included in all processed change orders for the progress month and each preceding month.
- B. Within 5 calendar days after receipt of the updated Contract Schedule in conjunction with the Application for Payment, the University's Representative shall review both and determine which work and material pay items qualify for payment; the approved data will then be returned to the **Contractor** for input. Within 14 calendar days, the **Contractor** and the University's Representative shall meet to review the Construction CPM Schedule and discuss any changes required.
- C. The **Contractor** shall then revise and resubmit (if required) the Updated Contract Schedule and Application for Payment to the University's Representative for payment approval.
- D. The monthly update shall be calculated using retained logic with a required finish date specified as the current contract completion date. Progress Override calculations shall not be acceptable.
- E. No Applications for Payment will be processed, nor shall any progress payments become due until updated Contract Schedules are accepted by University's Representative. The accepted, updated Contract Schedule shall be the Contract Schedule of record for the period it is current and shall be the basis for payment during that period. Acceptance of any updated Contract Schedules shall not relieve **Contractor** from its responsibility to fully complete the Contract within the Contract Time, nor shall it relieve **Contractor** from sole responsibility for any errors in the updated Contract Schedules.
- F. **Contractor** shall perform the Work in accordance with the updated Contract Schedule. **Contractor** may change the Contract Schedule to modify the order or method of accomplishing the Work only with prior agreement by the University.
- G. With each monthly updated Contract Schedule, the **Contractor** shall provide an accompanying narrative describing the progress anticipated during the upcoming month, critical activities, delays encountered during the prior month, delays anticipated during the upcoming month, and an audit of the Contract Time. The audit shall show current days allowed by contract, days used through the end of the month, days remaining, percent of time used to date, and percent complete as measured by cost loaded schedule, and days ahead of or behind schedule. In the event that the **Contractor** was delayed by any occurrence during the prior month, the narrative report shall include a listing of all delays that affected the critical path and shall clearly explain the impact the claimed delay(s) had on the critical path and shall include an accounting of days lost or gained.

- H. In the event the monthly update shows the **Contractor** to be behind schedule (negative float), the narrative shall include a description of actions needed to bring the project back on schedule.

3.05 LOOK AHEAD SCHEDULES

- A. Look Ahead Schedule is a schedule derived from the Contract Schedule (or the most current monthly update of the Contract Schedule) which indicates in detail all activities scheduled or worked on for the 1 prior weeks, and all activities scheduled to occur during the next 3 weeks.
- B. Provide detailed Look Ahead Schedules every week.
- C. Submit in 11-inch by 17-inch Gantt chart format.
- D. Look Ahead Schedule shall be generated from the then current Preliminary Contract Schedule, Contract Schedule, or updated Contract Schedule. Activities listed in the Look Ahead Schedule shall reference the activity identification or other such coding for correlation to the activities listed in the Contract Schedule.

3.06 TIME EXTENSION REQUEST DOCUMENTATION

- A. In the event the **Contractor** shall request an extension of Contract Time, **Contractor** shall comply with the requirements of the General Conditions, including without limitation, General Conditions Article 8. In addition to the requirements of the General Conditions, as a condition to obtaining an extension of the Contract Time, **Contractor** shall timely submit a sub-network of the events of the delay that demonstrates the impact to the activities in the **Contractor's** then current schedule, as well as the impact to the overall completion date of the project.
- B. If the University's Representative approves the extension of time, the next monthly updated Contract Schedule shall incorporate the subnetwork with the extension of time. In addition, the monthly updated Contract Schedule shall contain all changes mutually agreed upon by the **Contractor** and the University during preceding periodic reviews and all changes resulting from Change Orders and Field Orders.

3.07 AS BUILT SCHEDULE

- A. As a condition precedent to the release of retention, the last update of the Contract Schedule submitted shall be identified by the **Contractor** as the "As Built Schedule". The "As Built Schedule" shall be submitted when all activities are 100 percent complete. The "As Built Schedule" shall reflect the exact manner in which the project was actually constructed (including start and completion dates, activities, sequences, and logic) and shall include a statement signed by the **Contractor's** scheduler that the "As Built Schedule" accurately reflects the actual sequence and timing of the construction of the project.

3.08 WEATHER DAYS ALLOWANCE

- A. Should inclement weather conditions, or the conditions resulting from weather, prevent the **Contractor** from proceeding with seventy-five (75) percent of the normal labor and equipment force engaged in the current critical activity item(s), (as shown on the latest CPM Progress Schedule accepted by the University's Representative), for a period of at least five (5) hours per day toward completion of such operation or operations, and the crew is dismissed as a result thereof, it shall be a weather delay day.

- B. The expected loss of days specified in the Supplementary Conditions, item 3 "Modification of General Conditions, Article 8 – Contract Time", shall be included in a separate identifiable critical activity labeled "Weather Days Allowance" to be included as the last critical activity of the project schedule prior to substantial or final completion (whichever is contractual). The weather allowance activity shall be on, and remain on, the critical path of the project throughout the life of the project until it has been absorbed. Typically, all activity's leading to completion shall go through the weather allowance activity first. When weather days are experienced, and are approved as such by the University's Representative, the **Contractor** shall either:
1. Increase the duration of the current critical activity(ies) by the number of weather days experienced, or
 2. Add a critical activity to the schedule to reflect the occurrence of the weather day(s).
- C. The duration of the weather day allowance activity shall be reduced as weather days are experienced and included in the schedule. Any remaining weather days in the weather day allowance activity at the completion of the project shall be considered as float and shall not be for the exclusive use or benefit of either the University or **Contractor**.
- D. The **Contractor** shall not receive any additional compensation for unavoidable delays due to inclement or unsuitable weather. If all the weather allowance has been used, any additional weather delay experienced by the **Contractor** may result in a non-compensable time extension upon submission of acceptable supporting documentation to the University's Representative.

END OF SECTION 01 32 00

SECTION 01 32 20

CONSTRUCTION PROGRESS REPORTING

PART I - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements and procedures for documentation of construction progress using still photographs, videos, **[Webcam]**.
2. Requirements and procedures for As-built Documentation

B. Related sections include the following:

1. Division 01, Section "Closeout Procedures" for general closeout procedures.
2. Division 01, Section "Closeout Submittals."

1.02 PROGRESS PHOTOS/VIDEOS

A. Maintain a **daily** photographic record of the progress of the Work as outlined in Part III of this Section.

1. Photographs to accompany Superintendent Daily Reports will be done on a daily basis.

1.03 AS-BUILT DOCUMENTATION

A. The Contractor shall be responsible for the maintenance and completion of As-Built Documents the following procedure shall be strictly adhered to:

1. Contractor shall download and save all of the construction documents. This set of Drawings along with the Specifications, shall be kept on file available to University's Representative's until the completion of the Project.
2. As the Work progresses, a complete and accurate notation of all documented changes or deviations from the Drawings and Specifications shall be recorded thereon in the As-built Documents by the Contractor. Such indications shall be neatly made and kept current.
3. Do not complete Work or request inspections if such Work has been installed in locations contrary to the Drawings.

4. At the completion of the Project, Refer to Section 017800 CLOSE OUT SUBMITTALS.

PART II - PRODUCTS – Not applicable to this section.

PART III - EXECUTION

- 3.01 Contractor is required to maintain a **daily** digital photographic record of the progress of the Work and is to submit the photographs and video coverage as required to the University Representative. Daily Photographs are required for Superintendent Daily Reports.
- 3.02 Contractor is required to maintain the As-Built Documents on a **daily** basis.

END OF SECTION 01 32 20

SECTION 01 33 00

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 011100 – SUMMARY OF THE WORK: Subcontractor and materials suppliers list.
- B. Section 013200 – CONTRACT SCHEDULES: Submission and review of schedules and submittals.
- C. Section 014500 – QUALITY CONTROL: Test and Inspection Reports.
- D. Section 016100 - PRODUCT REQUIREMENTS
- E. Section 017700 – CLOSEOUT PROCEDURES: Occupancy/Acceptance /Final Payment Submittals.
- F. Section 017800 – 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 twenty-one (21) days from receipt to review all submittals twenty-one (21) days from receipt to review re-submittals.
 - 2) The Fire Marshal shall have twenty-eight (28) days from receipt to review all submittals twenty-eight (28) days from receipt to review 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 016100 – 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 the University's Project Name and the University's Project 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 Submittals: Submit PDF electronic file with booked marked table of contents and/or sheet index. Submittals for the Fire Department require an electronic file and two (2) hard copies.
 2. Initial/Re-submitted Shop Drawing Review(s): Submit PDF electronic file with booked marked table of contents and/or sheet index. Submittals for the Fire Department require an electronic file and two (2) hard copies.
 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 PDF electronic file with booked marked table of contents and/or sheet index. Submittals for the Fire Department require an electronic file and two (2) hard copies. **Contractor** is responsible for providing all approved shop drawings for its use and use by subcontractors and/or suppliers.
 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 number as the original submittal, followed by a letter indicating sequential re-submittal. Examples:
1. 092500 – 1 First submittal for Section 092500 – Gypsum Board
 2. 092500 – 2 Second submittal for Section 092500 – Gypsum Board
 3. 092500 – 2A Re-submittal of second submittal for Section 092500 – Gypsum Board
 4. 092500 – 2B Second re-submittal of second submittal for Section 092500 – Gypsum Board
- E. Resubmission Requirements: Revise and resubmit as specified for initial submittal. Identify any Changes other than those requested. Note any departures from Contract Documents or changes in previously reviewed submittals.
- 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. As-built Documents file maintained by **Contractor**.
 3. Pertinent Separate Contractors.
 4. Pertinent Subcontractors.
 5. Pertinent Supplier or Manufacturer.

1.06 SUBMITTAL SCHEDULE

- A. Submittals Schedule: refer to Section 013200 – 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 PDF electronic file with booked marked table of

contents and/or sheet index 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**.

1.07 ENVIRONMENTAL PRODUCT DECLARATIONS

- A. Contractor must comply with Buy Clean California Act requirements per California Public Contract Code, Sections 3500-3505.
- B. Contractor shall submit to Project Manager/Construction Manager current facility-specific Environmental Product Declaration for each eligible material proposed to be used on the Project.
- C. Environmental Product Declaration (EPD): Type III environmental impact label, as defined by the International Organization for Standardization (ISO) standard 14025, or similarly robust life cycle assessment methods that have uniform standards in data collection consistent with ISO standard 14025, industry acceptance, and integrity.
- D. Eligible Materials: Any of the following:
 1. Carbon steel rebar.
 2. Flat glass.
 3. Mineral wool board insulation.
 4. Structural steel.
- E. Eligible Materials installed on the Project by Contractor must comply with any standards to the extent established in the BCCA or by University, whichever is more stringent. The facility-specific global warming potential for any Eligible Materials must not exceed any existing maximum acceptable global warming potential for that material pursuant to the BCCA or by University, whichever is more stringent ("EM Standards"). The standards are published on the Department of General Services (DGS) website and updated information can be found on this link: <https://www.dgs.ca.gov/PD/Resources/Page-Content/Procurement-Division-Resources-List-Folder/Buy-Clean-California-Act>
- F. Contractor shall not install any eligible materials on the project before submitting a facility-specific Environmental Product Declaration for that material.
- G. This section shall not apply to an eligible material for a particular contract if the University determines, upon written justification published on its Internet website, that requiring those eligible materials to comply would be technically infeasible, would result in a significant increase in the project cost or a significant delay in completion, or would result in only one source or manufacturer being able to provide the type of material needed by the state.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01 33 00

SECTION 01 34 00

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 UC Davis Health.
- 1.02 This procedure applies to all Contractors and their subcontractors who have contractual agreements with UC Davis Health.

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 has occurred, and University operations will be opening the Hospital Command Center and shifting to emergency operations.
- 2.03 Code Red – Fire
- 2.04 Code White – Hazardous Material / Chemical Spill
- 2.05 Control Facility – the County of Sacramento has designated UC Davis Health as the Control Facility for Sacramento County. The Control Facility coordinates medical control of patients and victim's dispersal to hospitals in the community/region.
- 2.06 Other emergency situations include the following systems failures as outlined in the UC Davis Emergency Response Plan.
 - A. Water system failure
 - B. Telephone system failure
 - C. Fire
 - D. Electrical system failure
 - E. Security
 - F. Chemical spill
 - G. Evacuation

PART III - PROCEDURES

- 3.01 The **Contractor** will be issued a UC Davis Health 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 Sacramento campus are as follows.
 - 1. Emergency Telephone Numbers
 - a. Police Dispatch: 916-734-2555
 - b. PO&M Dispatch (Electrical) 916-734-2763
 - c. PG&E (Gas) 800-743-5000
 - d. City of Sacramento Water 3-1-1
 - e. HazMat Spill 916-734-2740

END OF SECTION 01 34 00

SECTION 01 35 00
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 011100 – SUMMARY OF THE WORK
- C. Section 013100 – COORDINATION
- D. Section 013200 – CONTRACT SCHEDULES
- E. Section 015600 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS
- F. Section 015610 – AIRBORNE CONTAMINANTS CONTROL
- G. Section 017300 – CUTTING AND PATCHING
- H. Section 017400 – 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) calendar 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 calendar 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 calendar 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 01 35 00



Fire Marshal's Office

4800 2nd Ave. #1200
 Phone: (916) 734-3036
 Fax: (916) 451-7754
 hs-fireprevention@ucdavis.edu

Interim Life Safety (ILSM)

Based upon documentation received (ILSM Impact worksheet) a risk analysis of this project has been made. The impairments to life safety systems have been identified and interim measure provided as set forth below.

PROJECT TITLE:	MAIN HOSP Radiology CT Site Trailer Project	OSHPD #	TBD	A/C#	9579140
ILSM START DATE:		END DATE:			
FIRE LIFE SAFETY DEFICENY(IES):					
INTERIM MEASURE(S):					

Unless otherwise noted below, these requirements apply to impairments of a duration extending beyond the current shift (greater than 8 hours)		ILSM1	ILSM2	ILSM3	ILSM4	ILSM5	ILSM6	ILSM7	ILSM8	ILSM9	ILSM10	ILSM11	ILSM12	ILSM13	ILSM14	ILSM15
Check all impairments that apply.																
	Construction activity or repair															
	Any impairment of a required egress															
	Fire detection ALARM system impairment greater than 4 hours ***															
	Fire SUPPRESSION system impairment greater than 10 hours															
	Fire &/or smoke door hardware impaired															
	Fire or smoke barriers with impairment															
	Missing or incomplete fire or smoke barriers															
	OTHER: <i>See below</i>															

**** Requires inspection by The Fire Marshal's Office prior to ILSM commencement.**

***** Fire Watch shall be documented and log provided to the Fire Marshal's Office at the end of each fire watch shift*****

Daily Inspection Log shall be completed by construction team daily & Fire Prevention staff weekly

INTERIM LIFE SAFETY IMPLEMENTATION MEASURES	
ILSM 1	Life safety deficiencies have been evaluated per UCDH Policy 1635 based upon the submitted ILSM Impact Worksheet
ILSM 2	Policy for deficiencies is followed for a sprinkler system out of service more than 10 hours in a 24 hour period & fire alarm out of service for more than 4 hours in a 24 hour period.
ILSM 3	Post signage identifying the location of alternative exits to everyone affected
ILSM 4	Inspect exits in affected area on a daily basis
ILSM 5	Provide temporary but equivalent fire alarm & detection system for alarm impairment
ILSM 6	Provide additional fire fighting equipment (i.e. fire extinguishers)
ILSM 7	Temporary construction barrier smoke-tight, will not contribute to the development of fire & of solid construction (see UCDH Policy 1635 & OSHPD 9-3301)
ILSM 8	Increase surveillance of building, special attention to construction area & storage
ILSM 9	Enforce storage, housekeeping & debris removal practices to reduce fire load
ILSM 10	Provide additional training to those who work in the hospital on the use of firefighting equipment
ILSM 11	Conduct one additional fire drill per shift per quart.
ILSM 12	Inspect & test <i>temporary</i> systems monthly. -Document testing
ILSM 13	Conduct education to promote awareness of building deficiencies, hazards & temporary measures
ILSM 14	Train those who work in the hospital to compensate for impaired structural or compartmental fire safety features
ILSM 15	OTHER:

Responsible Individual Signature: _____
 Date: _____

Fire Marshal's Office Signature: _____
 Date: _____



UC Davis Health
 Fire Marshal's Office
 4800 2nd Ave., Suite 1200
 Sacramento, Ca 95817
 916-734-3036
 hs-fireprevention@ucdavis.edu
 www.ucdmc.ucdavis.edu/fire/



Interim Life Safety Measure (ILSM) Impact Worksheet

This form is completed by the Project Manager or Contractor or Contractor's Representative. Complete the form and submit to the Fire Marshal's Office for an evaluation of the need for an ILSM, Fire Watch, or other safety measure.

Project Title:			
Date of Project(s):		Time of Project(s):	
A/C#		OSHPD #	
Project Description:			

	Yes	No
Project alters or significantly compromises exit access, exiting, or exit discharge building elements? If yes, provide a floor plan showing how exiting is affected. Temporary exit and/or evacuation signs may be required.	<input type="checkbox"/>	<input type="checkbox"/>
Compromise of building compartmentation including fire or smoke walls, floor / ceiling assemblies, corridor walls, use area doors, or other defend in place elements? If yes, describe in information.	<input type="checkbox"/>	<input type="checkbox"/>
The issue impairs the building fire alarms or sprinkler systems?	<input type="checkbox"/>	<input type="checkbox"/>
The activity includes significant ignition sources such as cutting, welding, or other operations using flame or producing sparks?	<input type="checkbox"/>	<input type="checkbox"/>
The activity includes large quantities of combustible materials, flammable materials, or generation of large amounts of dust and debris?	<input type="checkbox"/>	<input type="checkbox"/>
Access to fire or life safety equipment affected? If yes, what systems or equipment? (i.e.: fire watch, Fire Inspector, extinguisher, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
Are construction barriers present / required?	<input type="checkbox"/>	<input type="checkbox"/>



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Documentation – When ILSMs are required, the following documentation must be maintained:

- a. Training rosters
- b. Fire drill reports
- c. Monthly inspection and testing of temporary fire alarm, detection, and suppression systems
- d. Daily inspection of construction area
- e. Weekly inspection of buildings, grounds, and equipment with special attention to excavations, construction areas, construction storage, and field offices
- f. Completed ILSM form at the job site

Note* Contractor activities that pose an immediate threat to the health and safety or patients, visitors, hospital employees or construction personnel shall be discontinued immediately until the hazards are abated and corrected and the appropriate ILSM(s) are developed.

 Requestor's Signature

 Date

 UCDH Fire Marshal's Office Representative

 Date

Information:

SECTION 01 41 00
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. California State Fire Marshal Requirements
- E. Department of Health Care Access and Information Projects

1.02 RELATED SECTIONS

- A. Section 013500 – SPECIAL PROCEDURES
- B. Section 014200 – REFERENCES
- C. Section 014500 – 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 than 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, Laws, and Regulations:

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

a. California Code Series - 2022 Edition

- 1) California Administrative Code, California Code of Regulations – Title 24, Part 1
- 2) California Building Code, California Code of Regulations – Title 24, Part 2, Volume 1& 2
- 3) California Electrical Code, California Code of Regulations – Title 24, Part 3
- 4) California Mechanical Code, California Code of Regulations – Title 24, Part 4
- 5) California Plumbing Code, California Code of Regulations – Title 24, Part 5
- 6) California Energy Code, California Code of Regulations – Title 24, Part 6
- 7) Elevator Safety Construction Code, California Code of Regulations – Title 24, Part 7
- 8) California Historical Building Code, California Code of Regulations – Title 24, Part 8
- 9) California Fire Code, California Code of Regulations – Title 24, Part 9
- 10) California Existing Building Code, California Code of Regulations – Title 24, Part 10
- 11) California Referenced Standards Code, California Code of Regulations – Title 24, Part 12

b. NFPA Code Series. National Fire Protection Association (NFPA) (as adopted by State agencies)

- 1) NFPA 13 – Standard for the Installation of Sprinkler Systems.
- 2) NFPA 14 – Standard for the Installation of Standpipe and Hose System
- 3) NFPA 72 – National Fire Alarm and Signaling Code
- 4) NFPA 80 – Standard for Fire Doors and Other Opening Protectives

- 5) NFPA 99 – Health Care Facilities Code
 - 6) NFPA 101 – Life Safety Code
 - 7) NFPA 252 – Standard Methods of Fire Tests of Door Assemblies
 - 8) NFPA 701 – Standard Methods of Fire Tests of Flame Propagation of Textiles and Films
- c. California Code of Regulation Series (embodied in California model codes as noted above)
- 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
- d. Americans with Disabilities Act (ADA) 2010 (Federal Law)
- e. Rules and regulations of private and public utilities
- f. American National Standards Institute (ANSI)
- g. American Society of Testing Materials (ASTM)
- h. Federal Specifications (Fed. Spec.)
- i. Underwriters Laboratories
- j. Traffic controls per California MUTCD requirements
2. All dates to comply with editions adopted and 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 contractor's license appropriate for the work performed. Otherwise, specialty contractors shall be retained by the **Contractor** contractor to perform specialty work identified in the project scope.

1.05 PROJECT INSPECTIONS

- A. Provision of inspectors by University, if any, or by Department of Health Care Access and Information pursuant to this Section and Section 1.04 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 DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION PROJECTS

- A. Department of Health Care Access and Information (HCAI) 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. HCAI will approve an inspector for the Project who shall have full access to the Project at all times.
- C. HCAI 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. HCAI will require a Building Permit for project submitted by University's Representative. No HCAI Building Permit fees are required to be paid by the **Contractor**.
- E. HCAI will require Change Order Approval submitted by University's Representative.
- F. HCAI will require a Licensed **Contractor's** Declaration from the **Contractor**.
- G. HCAI 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 HCAI/CSFM 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 01 41 00

SECTION 01 42 00

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 014100 – 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 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. Construction Site: Same as site.

7. 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.
8. Equal or Equivalent: As determined by the University's Consultant as being of the same quality, appearance, utility, durability, finish, function, suitability, and performance.
9. Furnish: Means "supply and deliver, ready for unloading, unpacking, assembly, installation, and similar operations".
10. 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.
11. Install: Describes operations at the site including unloading, unpacking, assembly, erection, anchoring, applying, working to dimension, protecting, cleaning, and similar operations.
12. 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.
13. Jobsite: Same as site.
14. 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.
15. Noted: Same as indicated.
16. 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.
17. Per: In accordance with or in compliance with.
18. Products: Materials, systems or equipment.
19. Project site: Same as site.

20. 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.
21. Provide: Means "furnish and install, complete and ready for use".
22. 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.
23. 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.
24. Scheduled: Same as indicated.
25. 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.
26. Shown: Same as indicated.
27. 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.
28. Testing Laboratories: Same as Testing and Inspection Agency.
29. 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.
30. University-Furnished/**Contractor**-Installed (UFCI): Same as Owner-Furnished/**Contractor**-Installed.

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
HCAI	Department of Health Care Access and Information (State of California)
IAPMO	International Association of Plumbing and Mechanical Officials
IEEE	Institute of Electrical and Electronics Engineers, Inc.
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
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 01 42 00

SECTION 01 45 00
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's** responsibilities in inspections and tests
- H. **Contractor's** responsibilities regarding the University's testing laboratory
- I. Test reports
- J. Geotechnical engineer

1.02 RELATED SECTIONS

- A. Section 013100 – COORDINATION
- B. Section 014100 – REGULATORY REQUIREMENTS: Compliance with applicable codes, ordinances and standards.
- C. Section 014550 – INSPECTION and TESTING of WORK
- D. Section 016100 – PRODUCT REQUIREMENTS: Product Options, substitutions, transportation and handling requirements, storage and protection requirements, and system completeness requirements.

1.03 [CONTRACTOR'S] [CM/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 required by contract or necessary if not prescribed 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 and adjacent construction.
- 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 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. Manufacturer's Representatives shall provide a PDF electronic report indicating but not limited to work or materials that are missing, not installed correctly, damaged or need correction. Manufacturer's Representatives shall issue a final PDF electronic report once all work and materials are installed correctly, functioning and in compliance with the Manufacturer's Warranty.

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.

- E. Changes in mix designs for concrete and mortar after review and acceptance of submitted mix design. Test and inspections shall include, but not be limited to, the following:

List the applicable services required, for example:

Material Inspections and Tests		Paid by:
Concrete Reinforcement	Reinforcement Inspection	University
	Reinforcement Strength	University
Cast in Place	Slump Tests	University
	Compressive Strength Tests	University
Structural Steel	Welding Inspection	University
	High Strength Bolting Inspection	University

- F. Test and Inspection Reports: After each inspection and test, one (1) PDF electronic 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 014550 – INSPECTION and TESTING 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 UNIVERSITY 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) PDF electronic copy of all reports to the University's Representative, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

- 1.12 University will distribute one (1) PDF electronic copy of the reports to University's Consultants and **Contractor**. GEOTECHNICAL ENGINEER (If applicable or 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 01 45 00

SECTION 01 45 10
SEISMIC CONTROL – HCAI

PART I - GENERAL

1.01 DESCRIPTION

- A. Provide all required seismic restraints and calculations to ensure 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. 2022 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 including shop drawing and other documentation to comply to the requirement of 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 all tests, engineering calculations and documentation required to obtain Department of Health Care Access and Information (HCAI) 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 HCAI Pre-approved Manufacturer's Certification (OPM) as noted on the design drawings with only one applicable OPM per application.

PART II - 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 HCAI OPM determined by the DOR shall be considered as the specified seismic design for this project. Other non-OPM designs may be submitted as an alternate if they meet or exceed all the requirements contained within these specifications, HCAI pre-approved service loads, installation applications, and engineering services.
4. Channel framing materials, fittings and related accessories shall be as indicated on the OPM and on the drawings. All channel members (trapezes and braces) shall be solid strut. Field drill bolt holes at 1/16" larger than bolt size as required for connections. Back-to-back struts shall be stitch groove welded or button welded.
5. To facilitate plan review and construction, all construction documents should include an equipment schedule identifying all applicable equipment, its classification (fixed, movable, mobile, other, countertop, interim or temporary) and reference to support and attachment per Pin 68-Table 1.

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, fire sprinkler and architectural.
 - b. Without referencing OPM or HCAI 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 HCAI 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, etc., regardless of size and weight shall be seismically braced per the OPM or HCAI pre-approved design.
 - e. Support and attachment requirements for fixed, interim, mobile, movable, other, and temporary equipment shall be in accordance with HCAI PIN 68.
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 HCAI.
- 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. HCAI 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. HCAI 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 scanning of the slab and wall for clearances, and to prevent damages to embedded electrical conduits and/or mechanical piping and reinforcing steel.
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 III - 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 01 45 10

SECTION 01 45 50

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 013100 – COORDINATION
- B. Section 013200 – CONTRACT SCHEDULES
- C. Section 013500 – SPECIAL PROCEDURES
- D. Section 014100 – REGULATORY REQUIREMENTS
- E. Section 014500 – QUALITY CONTROL

1.03 DEFINITIONS

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

1.04 PROJECT INSPECTIONS AND TESTING PROCEDURES

- A. Inspections: This Project (is) (is not) under the jurisdiction of the Department of Health Care Access and Information. The following inspections will be requested on this project, as appropriate. Also see Part 3 for non-HCAI inspection items or Part 3, Item 3.11 for HCAI 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 HCAI/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. HCAI Field Compliance Inspectors: Fourteen (14) calendar days.
 3. Testing Laboratory Inspections: Forty-eight (48) 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. Emailed inspection requests will be accepted. University's Representative email address is lfuka@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 013100 – 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-HCAI 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 3.11 for Testing, Inspection Observation for HCAI.

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 jobsite 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 jobsite 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 jobsite 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 documents 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.
 - a. Check top of wall to structure fire stopping.
6. Check above ceiling areas and construction prior to installation of ceilings.
 - b. Check access and serviceability for above ceiling to included but not limited to valves, mechanical equipment, electrical equipment and other components that require adjustment, access or service.
 - c. [Contractor] [CM/ Contractor] [Design Builder] shall move any items including but not limited to conduit, piping, braces and other obstructions that block access to equipment and components needing adjustment, access or service.
 - d. Check bracing, anchorage, fasteners and installation.

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 HCAI – Testing, Inspection and Observation (TIO)(If applicable or NOT USED)

Note: This item describes the required code related inspection items for HCAI projects. It will be completed by design professional prior to construction. This checklist is not intended to be all-inclusive, and contractor should verify actual inspection requirements. (Attach completed and approved HCAI TIO form signed by Architect/Engineer of Record for required testing.)

3.12 Refer to the following attachment

- A. Inspection Request
- B. Non-conforming Work Notice

END OF SECTION 01 45 50

INSPECTION REQUEST

Project #: _____ HCAI #: _____ UCDH IR #: _____ [Contractor][CM/Contractor][Design-Builder] IR #: _____ Date: _____
 Project Name: _____ Spec Section (s): _____

To: UC Davis Health Facilities Design & Construction – Inspection Trailer 4430 V Street, Building 35 Sacramento, CA 95817 P: 916-734-5060 Email: lfuka@ucdavis.edu & Project IOR	From: _____ _____ _____ P: _____ E-mail: _____
--	--

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][CM/Contractor][Design-Builder]'s Superintendent prior to notification of Inspection Request.
 Signed: _____ Date: _____

UNIVERSITY 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)	
<i>Project Phase (Building Foundation, Structural, Wall Framing, Electrical Rough-In, Sprinkler Rough-In, etc.)</i>	
Project Phase Percentage Complete (% of the phase completed): _____	Overall Project Percentage Complete: _____

NON-CONFORMING WORK NOTICE

PROJECT #: _____ HCAI #: _____ Notice #: _____ Date: _____

To: Casey Lubawy/calubawy@ucdavis.edu Jeff Stein/jeff.stein@steinarchitectx.net <u>IIF HCAI PROJECT, AREA COMPLIANCE OFFICER/EMAIL</u> _____ _____	From: UC Davis Health IOR Facilities Design & Construction – Inspection Trailer 4430 V Street, Building 35-A Sacramento, CA 95817 P: 916-734-5060
--	---

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:

SECTION 01 51 00
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, Data, and WIFI.

1.02 RELATED SECTIONS

- A. Section 011100 – SUMMARY OF THE WORK
- B. Section 013500 – SPECIAL PROCEDURES: General requirements for temporary facilities and controls, to accommodate the University's occupancy and use of the areas and spaces adjacent to construction.
- C. Section 015610 – AIRBORNE CONTAMINANTS CONTROL
- D. Section 017400 – CLEANING
- E. Section 017700 – 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. The services will be provided at the current rates for each utility.

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 017400 – 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 26– Electrical or Campus Design Guidelines.
 - 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 015610 – 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 33 and 22 for requirements or Campus Design Guidelines
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 that 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 013500 – SPECIAL PROCEDURES.

1.08 TEMPORARY TELEPHONE, DATA, INTERNET, and WIFI

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, data internet, and WIFI 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, data, internet and WIFI service.
 3. **Contractor** shall select number of lines, instruments and other features.
 4. **Contractor** shall prepare and submit to University an itemized request for telephone lines (according to option 2a or 2b above) and internet service. Project Manager will submit a service request to the IT department.
- 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. UC Davis Health closed-circuit television or radio signals.
 - f. Cellular or other mobile phone systems in main hospital.
 - g. UC Davis Health voice or digital paging systems.

- E. Temporary Internet Service: Provide a high-speed internet connection (Min. 20 Mbps download, 10 Mbps upload) to Contractor's field offices. The Contractor's and University's field offices shall be capable of sending and receiving e-mail and be able access the Internet.
 - 1. **[WIFI coverage at the above internet speeds will be provided throughout the jobsite]**

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.
- D. Modems compatible with internet service.

PART III - EXECUTION

3.01 INTERRUPTION OF EXISTING SERVICES

- A. No existing utility services shall be interrupted at any time without prior written approval from the University. Required shutdowns shall be scheduled a minimum of fourteen calendar days prior to actual shutdown. The operation of valves, switches, etc. will be performed and paid for by University.
 - 1. Prior to the outage, all possible Work shall have been completed which will minimize the length of the required outage. During the outage, the Work will be prosecuted with diligence by an adequate number of skilled personnel.
 - 2. Provide and pay for all personnel required by the University to maintain safe conditions during the outage including but not limited to fire watch, safety monitors and/or traffic control. Coordinate Work with University's Representative.

3.02 REMOVAL OF TEMPORARY CONSTRUCTION

- A. At the completion of the Work, the Contractor shall remove from the Project site all temporary utilities and services construction. Leave the Project site clean and free from debris, materials, or equipment.

END OF SECTION 01 51 00

SECTION 01 52 00
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 011100 – SUMMARY OF THE WORK
- B. Section 013500 – 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 017400 – CLEANING
- D. Section 017700 – CLOSEOUT PROCEDURES

1.03 FIELD OFFICES AND SHEDS

(PROJECT MANAGER SHALL EDIT TO ADDRESS SITUATION**)**

- A. Field Office: **Contractor** shall provide a job office that will conform to the following minimum requirements:
 - 1. Suitable space for Work Stations, 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, Data and WIFI service as specified in Section 015100 – 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 jobsite 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 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.
 - 5. Security cameras for remote video surveillance of the project site and 24/7 monitoring services that records and reports incidents and alarms. Security cameras to provide full coverage of the construction and storage site area.
- 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. Remove all temporary construction facilities above and below grade. Leave the project site clean and free of debris, materials and equipment.

PART II - PRODUCTS

2.01 MATERIALS

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

PROJECT NO. 9579140
MAIN HOSP Radiology CT Site Trailer Project

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01 52 00

SECTION 01 55 00
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 011100 – SUMMARY OF THE WORK
- B. Section 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- C. Section 013500 – 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 017400 – CLEANING
- E. Section 017700 – 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.
 - 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.
 1. Fire Lanes to remain open at all times and shall not be blocked without a Traffic Control Plan provided prior to work at the Fire Lane and approved by the University's Representative.
- 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, Traffic Message Boards, 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 (If applicable or NOT USED)

(PROJECT MANAGER SHALL EDIT AS REQUIRED BY PROJECT SIZE**)**

- A. Project Identification Sign: **Contractor** shall provide one (1) project sign. Sign will consist of one (1) 8' x 4' x $\frac{3}{4}$ " exterior grade plywood with medium or high-density phenolic sheet overlay, painted plywood sign on fence area at construction field office or yard.
1. Information on sign shall include PROJECT NAME, University of California, Davis Health, University's consultants, etc. Copy will be provided by the University.
- B. Painted Informational Signs: Provide at each field office, storage shed and yard, directional signs to direct traffic into and within site. Relocate as Work progress requires.
- C. Maintain signs and supports: Clean, repair deterioration and damages.
- D. Remove signs, framing, supports and foundations at completion of Project and restore the area.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION – Not Applicable to this Section

END OF SECTION 01 55 00

SECTION 01 56 00

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 011100 – SUMMARY OF THE WORK
- B. Section 013500 – SPECIAL PROCEDURES
- C. Section 013900 - GREEN BUILDING POLICY IMPLEMENTATION
- D. Section 015610 – AIRBORNE CONTAMINANTS CONTROL
- E. Section 017400 – 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 20-gauge metal studs spaced 24" o/c maximum and covered on both sides with 5/8" thick Type-X rated gypsum wallboard fire 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, TX77033 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 University 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 the 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 prohibitor 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 UC Davis Health 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 013500 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 the campus, as directed by University, to be selectively sorted by the 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 watercourses. Silt deposited as a result of the Work shall be removed and disposed of by **Contractor** at no cost to the University.
1. Rough grade site to prevent standing water and to direct surface drainage away from excavations, trenches, adjoining properties and public rights-of-way/s.
 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. Winterize and stabilize site with Geotextile Fabric and gravel so that the site drains and avoids it becoming a quagmire. Maintain access roads on the site with Geotextile Fabric and gravel and make repairs to avoid furrow, ruts, or potholes.

6. 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 jobsite.

PART II - PRODUCTS

- 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.

PART III - EXECUTION

- 3.01 Infection Control Risk Assessment ICRA Requirements:
- A. ****DELETE SECTION IF NON-PATIENT CARE SPACE*** NON-CLINICAL DUST CONTROL COVERED BY 1.03***
1. Refer to attached Infection Control Risk Assessment (ICRA) and UC Davis Health Construction Dust & Hazardous Materials Inspection Worksheet.
 - a. These documents dictate minimum requirements for Class I and II containments and minimum requirements that must be completed to control dust during construction.
 - 1) Mini containments (pop-up cubes) which are designed to have at most 1-2 people may be used in lieu of custom-built Class II Containments.
 2. The outside of the work containment shall have present: ICRA Permit, Interim Life Safety Measure (ILSM) Permit, Daily ICRA Inspection Forms, entry warning sign, Containment Entry Log (provided by the contractor) that lists all persons who enter the containment regardless of affiliation, including all University employees, and an emergency telephone number of persons to call 24 hours.
 3. 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 a designated University representative. Work cannot begin until the work containment has been inspected and approved.

3.02 Refer to the following Attachments:

- A. Appendix A - Construction Dust & Hazardous Materials Inspection Worksheet
- B. Appendix B - Initial Information and Benchmark Containment Inspections
- C. Appendix C - Entry Warning Sign with Project Manager Contact Information

END OF SECTION 01 56 00

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

VERIFICATION OF WORK

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



(THIS SIGN MUST BE POSTED IN COLOR)

SECTION 01 56 10

AIRBORNE CONTAMINANTS CONTROL

PART I - GENERAL

1.01 SUMMARY

- A. Section Includes: University airborne contaminants control policy procedures and an Infection Control Risk Assessment (ICRA) and plan.

1.02 POLICY

- A. Airborne contaminants control is critical in all hospital areas, as well as non-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 or other airborne contaminants 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. All work at hospital facilities shall follow the recommended UC Davis Medical Center Construction Dust Infection Prevention Best Practices Standard, Version 4.0 – December 2022 or the most recent version.
- D. Should the scope of work change or the discovery of additional toxic materials such as asbestos, lead and radioactive materials or biological substances such as visible mold growth, STOP WORK and seek additional approval and guidance before proceeding. If the above potential materials newly discovered 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 University's Representative immediately. This includes projects that are already considered and operating under a Class IV.
- E. Related Sections:
 - 1. Section 017300 – CUTTING AND PATCHING: Removal of debris may be outside of normal work hours and shall be in tightly covered containers.
 - 2. Section 013500 – SPECIAL PROCEDURES: Perform work in accordance with requirements of this section.

3. Section 013900 - GREEN BUILDING POLICY IMPLEMENTATION
4. Section 015100 – TEMPORARY UTILITIES: Provide high efficiency particulate air (HEPA) filters as specified in Section 015610, negative pressure ventilation, or special control of existing system as determined by University's Representative.
5. Section 015600 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS: Extend barriers above ceilings as required to seal off and contain airborne contaminants.
6. Section 015600 – TEMPORARY CONTROLS: Contain waste materials during removal; bagging, wrapping, and transporting.
7. Section 017400 – 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 and clean work area daily. Excess construction debris shall be cleaned daily by the end of each work shift. Disinfect Containment and Protection Areas as directed by University's Representative

F. Dust Mitigation Requirements

1. An ICRA Daily Inspection Log ~~Compliance Survey~~ is attached at the end of this section under UC Davis Health Construction Dust Infection Prevention Best Practice Standard. 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.

G. UC Davis Health Construction Dust Infection Prevention Best Practice Standard

- a. The UC Davis Health Construction Dust Infection Prevention Best Practice Standard is attached at the end of this Section and augments information & requirements of Section 015610.
- b. Refer to the UC Davis Health Construction Dust Infection Prevention Best Practice Standard per requirements for.
 - 1) Responsibilities
 - 2) Procedures
 - 3) Training And Certifications
 - 4) Containment Design & Construction
 - 5) Materials And Equipment
 - 6) Cleaning Procedures
 - 7) Documentation

- 8) Containment Verification
- 9) Inspection Criteria
- 10) And other Dust Infection Prevention Measures

1.03 SUBMITTALS

- A. Submit to Project Inspector or Post at Anteroom Daily ICRA Inspection Log.
- B. Schedules: Submit work areas and procedure schedules for containment of airborne contaminants. Include this work in the Project Schedule per 013200.
- C. Detailed Work Plan: Drawings including but not limited to Work Area/ Floor Plan, Path of Travel, Egress and Exiting, Rated Construction 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.
 1. As applicable, the drawing should include the following: location of ante room(s), location of manometer, location of negative air units exhausting outside the construction area including number of negative air units and sizes (cfm), and location of sealed blocked off areas of corridors. If the exhaust of the negative air unit(s) cannot be exhausted outside of the building, the work plan shall include details, product documents and drawings of the approved fire-rated assemblies that will be used to meet Fire Codes (if applicable), Building Codes and ILSM requirements. Any impacts to corridors will need to be approved via ILSM (see specification section 013500 for details).
 2. Identify the areas surrounding the project area, assessing potential impact of construction on the patient care area. Identify the specific uses (e.g., patient rooms, medication room, operating room, etc.)
 3. Identify the potential impacts including but not limited to.
 - a. HVAC, Ventilation (outages, air flow directions, clean to dirty, air intakes/exhausts, air balance, disruptions, etc.).
 - b. Plumbing (outages, hand-washing access, work area, flushing/draining systems, charging systems, disinfecting systems, etc.).
 - c. Electricity (outages for critical equipment, special ventilation areas, monitoring).
 - d. Identify Airborne infection isolation rooms and patient rooms with immuno-compromised conditions that will require High-efficiency Particulate Air (HEPA) filters.
 4. Identify containment measures including but not limited to types of barriers to be used. HEPA filtration to be used. Renovation/construction areas should be isolated from occupied areas during construction and provide clean-to-dirty airflow with respect to surrounding areas.
 5. Assess preventive maintenance requirements. Will the service/maintenance frequency and level of service of systems need to be modified during construction (e.g., ventilation filters, air intake system, potable water, plumbing,

- doors). Work Hours: Can or will the work be done during non-patient care hours?
6. Include provisions for but not limited to traffic flow, entrance, egress, control, debris removal and housekeeping.
 7. Work Hours: Identify areas of work that will be done during non-patient care hours. Refer to Sections 011100 Summary of Work and Section 011400 Work Restrictions
 8. The Detailed Work Plan shall be reviewed and approved by the University's Representative prior to the start of Construction.
- D. Project Experience and Training: To be considered qualified to work with negative pressure containments; **Contractor's** 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
 - d. Completion of an ICRA training course approved by University
 3. Documentation that all contractor employees and subcontractor's employees have successfully completed an ICRA training class that is approved by University. All personnel working with negative pressure containments shall be trained and knowledgeable in the following:
 - a. ICRA Permit contents and requirements
 - b. Site specific containment plan requirements that follow best management practices
 - c. Infection risks associated with construction
 - d. Methods to control the dissemination of dust and fungal spores
 - e. Proper use of protective clothing
 - f. Proper entry and exit procedures
 - g. Manufacturer's requirements, where manufactured containment systems are used (e.g., portable pop-up cubes)
 - h. How to respond to a loss of negative pressure or too much negative

pressure

i. Breach in practice response and required notifications

4. Contractors shall be additionally trained in the following:

a. Proper containment design, construction, and maintenance techniques

b. Proper load out techniques for equipment/wastes

c. Containment cleaning regime: daily, final, and terminal cleaning

5. Containment failure emergencies caused by the contractor may require retraining at the discretion of the University's Representative Infection Control, or Environmental Health & Safety. Training is to be provided by University Environmental Health & Safety or a University approved training consultant.

6.

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 as required in their ICRA work plan.
- B. Review by PO&M HVAC staff for possibility to disconnect air supply and return into the project area
- C. Review by University Plant Operation & Maintenance Electrical staff for required electrical needs.
- D. Negative air machines shall be connected to separate electrical circuits.
- E. 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, electrical outlets, gaps at ceilings and other openings within the area where contaminants can escape. Sealing the critical openings can be accomplished with fire-rated tape, fire-rated plastic, fire-rated 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 Contractor's. 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 (ICRA permit) issued by Infection Prevention requiring compliance with one of five precaution levels. The ICRA program is documented in Hospital P&P 2120. ICRA's 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. ICRA Permits expire and can be extended subject to approval by the Infection Prevention Department.

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 UC Davis Health 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 (I, II, III or IV) and approved ICRA Permit.
3. **Contractor** shall ensure that all workers are trained and adhere to the mitigation requirements including provisions indicated per UC Davis Health Construction Dust Infection Prevention Best Practice Standard attached at the end of this Section.
4. The contractor shall ensure that all site workers, including subcontractors, are knowledgeable of the requirements of plans, specifications and approved ICRA permit precautions and the reasons for controlling construction dust.
5. The contractor is required to stop work at times of excessive noise/vibration, when containment is breached, when this standard is not being complied with and when directed by University Representatives.
6. **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.

7. If project construction activities will occur beyond the expiration date identified in the ICRA Permit, **Contractor** shall coordinate with University's Representative to request extension of the ICRA Permit utilizing the ICRA 2.0 PermitForm attached ~~provided~~ at the end of in this section.

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.
- B. Approved one-hour fire-rated temporary containment systems that meet ASTM E84, Class A requirements for smoke and fire for fire rated assemblies/enclosures.
- C. Fire-rated tape for sealing critical barriers and attaching plastic to building components.
- D. Approved fire damper systems used to control smoke/fire in a fire-rated containment assembly.

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. PM TO MODIFY THIS SECTION. ATTACH ICRA PERMITS, EH&S WORKSHEETS, OR ANY OTHER APPLICABLE DOCUMENTATION
- B. THE BELOW LISTED CRITERIA ARE POSSIBLE STRATEGIES FOR CLASS 3 AND 4 CONTAINMENTS. NOT ALL OF THE STRATEGIES WILL BE ALLOWED OR REQUIRED. THE ICRA PERMIT AND EH&S WORKSHEET DEFINE WHAT IS ALLOWABLE. THINK OF THE ICRA PERMIT AND EH&S WORKSHEET AS A MENU. THE BELOW IS A DETAILED DESCRIPTION OF EACH ITEM ON THAT MENU.

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 University 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 UC Davis Health Infection Prevention shall be used on the project site.
- C. Contractor shall inspect the containment daily prior to starting work and immediately repair any breaches, holes, or other issues.

- D. For projects of extended length when work activity is not being performed, including on weekend or holiday periods, and if the work area had a very thorough surface cleaning and received a passing visual inspection by a third party environmental consultant, the daily inspections are not required. At a minimum, ICRA inspections shall be made weekly for containments on projects of extended non-work activity.
- E. 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.
- F. 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 fire-rated 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 as critical barriers. Materials used to block off these critical barriers in a temporary construction area not exceeding 30 days may be constructed of 6-mil fire-rated plastic. Materials used to block off these critical barriers in a construction area exceeding 30 days shall be constructed of an approved fire-resistive material other than 6 mil plastic.
 - 4. All polyethylene (plastic) 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. Flapped doorways consisting of overlapping plastic are not acceptable in the building.
 - 5. Creation of the negative pressure enclosure includes the requirement to complete temporary barrier walls in the attic space from the top of the ceiling to the underside of the roof deck in the project area when the ceiling system is opened.
 - 6. Creation of negative pressure enclosure includes sealing wall cavities that are opened to prevent air transmission between adjacent spaces and the attic space that has air pathway to the attic space.
 - 7. For temporary construction projects that do not exceed 30 calendar days, temporary work area containments may be constructed of 6-mil fire-rated polyethylene. Approval for this shall be by the Fire Marshal.
 - 8. For projects that exceed 30 calendar days, all barriers used to construct the temporary containment systems in the project area shall be hard barriers that meet the ASTM E84, Class A requirements for smoke and fire. This will include the use of a hard door integral to the temporary containment system to allow access and egress to and from the construction area.

9. Smoke detectors that are present inside of the construction work area can be temporarily covered during the work shift with a loose-fitting plastic “shower cap” that is commonly used on projects to prevent smoke alarms from inadvertently being triggered from dust. If this temporary dust control measure is used, the plastic covers shall be removed at the end of each work shift.
- G. 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.
- H. Double Ante Rooms with Negative Air Unit Attached to One Ante Room
1. In some locations when the negative air exhaust cannot be directed outside the building, and while temporary barriers are being installed, use of two anterooms connected in series to the construction zone may be used temporarily until full negative pressure containment is achieved. The use of double anterooms is a temporary measure and shall not be considered a primary means of negative pressure for control of dust. It must receive approval by Infection Prevention or EH&S before it can be considered. The configuration includes two anterooms connected with the clean anteroom accessible from the corridor, room, or space to access the project area. The second anteroom is connected to the construction work area.
 2. If approved, a HEPA filtered negative air unit shall be attached to the anteroom that is connected directly to the construction work area. This anteroom is considered the “dirty” anteroom because air is drawn into this room from the construction area. The first anteroom accessible from the corridor, room or space is considered a “clean” anteroom because air is unidirectional, moving into the second anteroom.
- I. 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 shall have a HEPA filtered negative air unit attached or integral to the cube to create a negative pressure work environment inside of the cube. Cubes are reviewed and approved by the University’s Representative on a case by case basis.
- J. 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.
- K. 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. HEPA filtered air shall not be discharged into existing HVAC supply ducts, return ducts, exhaust ducts or building plenum spaces unless there is a dedicated exhaust duct available in the construction project area and is approved for use by the University Plant Operations & Maintenance.
- B. The University's Representative shall determine if there is available a dedicated exhaust duct within the project area that is not connected to other exhaust ducts for exhaust out the building. This option can be considered if there are no other ducts attached to the exhaust duct, since other systems attached to the main exhaust duct might be pressurized, changing designed exhaust volumes, or creating back flushing of air in other connected ducts. Use of this option shall be reviewed and approved by University Plant Operations & Maintenance.
- C. 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.
- D. If negative air exhaust is required to be exhausted through a fire-rated assembly, the air shall be directed through approved fire-rated temporary containment systems that meet ASTM E84, Class A requirements for smoke and fire.
- E. When the air from the negative air units is 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.
- F. 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.
- G. Dual HEPA Units operating in parallel may be required for redundancy in high-risk areas.
- H. 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
2. Demonstrate negative pressure is achieved continuously (24/7) by means of an electronic manometer sensitive to measure down to -0.020" wp. The manometer shall be capable of measuring the water pressure down to at least -0.001" in-WC.
3. 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.
4. Inclined manometers using a liquid water solution and non-digital air pressure gauges are not an acceptable manometer since they do not meet the sensitivity of measuring -0.001" WC.
5. Zero pressure or positive pressure is unacceptable and must be responded to immediately. Locate and repair holes or breaches in exterior containment system with tape. Secure zip poles if they have fallen. Close entry door by zipping lower or closing flaps and securing.

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.

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. 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 a minimum of -0.020 in-WC during work periods and during off hours.
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.
3. All people who enter and leave the project containment area including the contractor and all subcontractor employees are responsible for removing a dirty sticky mat and replacing it with a clean one when it is necessary. This includes all University Representatives, Consultants, Infection Prevention, Inspector of Record, Environmental Health & Safety, Engineers, Architects, etc.
4. People 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 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. Disposable coveralls are required to protect the patients and are considered Patient Protective Apparel (PPA), since they are designed to protect patients who might be susceptible to the dust generating activity of the construction area.

2. Coveralls are not necessarily considered personal protective equipment (PPE), which is designed to protect the worker, unless the work activity involves asbestos, lead or other chemicals involved in the construction area.
3. Proper use of the disposable coveralls, booties and use of the sticky mat shall be followed at all times for all workers and UC Davis Health 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 University's Representative forty-eight (48) hours prior to containment set up.
- B. Build containment in compliance with ICRA, drawings and plans.
- C. Notify University's 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 University's Environmental Health & Safety Personnel, or by a designated representative of the University. 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. Use an appropriate attachment to ensure all large dust is removed. Vacuum slowly and pay special attention to cracks and crevices where dust may have accumulated.
- C. Prepare a measured solution of a University approved Environmental Protection Agency listed disinfectant and use according to the instructions on the label. Using clean towels or sponges, wipe all surfaces with the disinfectant. If visible dust accumulates on the applicator, wipe again until no residue is detected. Frequently change to clean applicators. Leave the surface wet and allow to air dry. Do not wipe dry.
- D. Remove the top floor layer, if present and HEPA vacuum and wipe down the bottom floor layer. The inspection will not be performed until the containment is dry.
- E. Additional HEPA filtered negative air units may be installed for scrubbing of particles (see 3.05 B).
- F. Coordinate with the University's 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.

- G. 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.
- H. The University's Representative is required to provide a 24-hour notification to University Environmental Services that terminal cleaning will be needed, in addition to notification at the time the containment is being removed. Note that containment removal cannot take place until the Contractor has completed a full cleaning of the containment and the final visual inspection has passed.

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.

3.10 Refer to the following Attachments

- A. Infection Control Risk Assessment (ICRA) with Matrix of Precautions for Construction & Renovation: 3 Pages.
- B. Infection Control Construction Permit: 1 Page.
- C. UCDH Construction Dust & Hazardous Materials Inspection Worksheet: 1 Page.
- D. ICRA Permit Extension Request and Instructions: 2 Pages.
- E. UC Davis Health Construction Dust Infection Prevention Best Practice Standard: 23 Pages including.
 - 1. Appendix A: Inspection Documentation Form and Daily Inspection Log.
 - 2. Appendix B: Entry Warning Sign with Project Manager Contact.
 - 3. Appendix C: Staff Education Poster.

END OF SECTION 01 56 10

BASIC PROJECT INFORMATION			
Project Name:	Project Number:	Today's Date	
Impacted Department(s):	Building Number and Name:	Floor:	Suite/Room:
Estimated Construction Start Date:		Estimated Completion Date:	
UCDH Project Manager:	UCDH PM Mobile Phone #:	UCDH PM Email:	
Construction Manager:	CM Mobile Phone:	CM Mobile Email:	

GENERAL PROJECT SCOPE

ATTACH DESCRIPTIVE PROJECT SCHEMATIC OR IMAGE TO PACKET

MULTIDISCIPLINARY TEAM

Identify the multidisciplinary team that was included in the review of this packet and agree with the requirements identified within the packet.

Department	Name	Email
UCDH Project Manager		
Fire Marshal's Office		
Infection Prevention		
Environmental Health & Safety		
Contractor Representative		
Other Multidisciplinary Team Members		

INFECTION CONTROL RISK ASSESSMENT

Step One: Using the table, identify the Construction Project Activity Type (A-E).

Type A <input type="checkbox"/>	<p>Inspection and non-invasive activities. Includes but is not limited to:</p> <ul style="list-style-type: none"> • Removal of ceiling tile for visual inspection-limited to 1 tile per 50 square feet with limited exposure time. • Limited building system maintenance (e.g., pneumatic tube station, HVAC system, fire suppression system, electrical and carpentry work to include painting without sanding) that does not create dust or debris. • Clean plumbing activity limited in nature.
Type B <input type="checkbox"/>	<p>Small-scale, short duration activities that create minimal dust and debris. Includes but is not limited to:</p> <ul style="list-style-type: none"> • Work conducted above the ceiling (e.g., prolonged inspection or repair of firewalls and barriers, installation of conduit and/or cabling, and access to mechanical and/or electrical chase spaces). • Fan shutdown/startup. • Installation of electrical devices or new flooring that produces minimal dust and debris. • The removal of drywall where minimal dust and debris is created. • Controlled sanding activities (e.g., wet or dry sanding) that produce minimal dust and debris.
Type C <input type="checkbox"/>	<p>Large-scale, longer duration activities that create a moderate amount of dust and debris. Includes but is not limited to:</p> <ul style="list-style-type: none"> • Removal of preexisting floor covering, walls, casework or other building components. • New drywall placement. • Renovation work in a single room. • Nonexistent cable pathway or invasive electrical work above ceilings. • The removal of drywall where a moderate amount of dust and debris is created. • Dry sanding where a moderate amount of dust and debris is created. • Work creating significant vibration and/or noise. • Any activity that cannot be completed in a single work shift.
Type D <input type="checkbox"/>	<p>Major demolition and construction activities. Includes but is not limited to:</p> <ul style="list-style-type: none"> • Removal or replacement of building system component(s). • Removal/installation of drywall partitions. • Invasive large-scale new building construction. • Renovation work in two or more rooms.
Type E <input type="checkbox"/>	<p>Exterior Construction typical activities. include, but are not limited to:</p> <ul style="list-style-type: none"> • Excavation, Trenching, Grading, Boring, Pile Driving, Demolition • Asphalt, Concrete, Stucco, Scaffolding • Roofing • Window washing, Caulking, Tuckpointing, Cleaning, Painting • Landscaping, Planting

Explain this Reasoning for this Assessment:

Step Two: Using the table below, identify the Patient Risk Group(s) that will be affected. If more than one risk group will be affected, select the higher risk group.

Low Risk Non-patient care areas such as:	Medium Risk Patient care support areas such as:	High Risk Patient care areas such as:	Highest Risk Procedural, invasive, sterile support and highly compromised patient care areas such as:
<input type="checkbox"/> Office areas not on clinical units <input type="checkbox"/> Breakrooms not on clinical units <input type="checkbox"/> Bathrooms or locker rooms not on clinical units <input type="checkbox"/> Mechanical rooms not on clinical units <input type="checkbox"/> EVS closets not on clinical units <input type="checkbox"/> Corridors and gathering areas not near clinical units	<input type="checkbox"/> Waiting / Lobby areas <input type="checkbox"/> Clinical engineering <input type="checkbox"/> Materials management <input type="checkbox"/> Sterile processing department - dirty side <input type="checkbox"/> Cafeteria, gift shop, coffee shop, and food kiosks <input type="checkbox"/> Public hallways and gathering areas near clinical units	<input type="checkbox"/> Patient care rooms and areas <input type="checkbox"/> All acute care units <input type="checkbox"/> Emergency department <input type="checkbox"/> Employee health <input type="checkbox"/> Pharmacy: General Work Zone <input type="checkbox"/> Medication rooms and clean utility rooms <input type="checkbox"/> Imaging suites: diagnostic imaging <input type="checkbox"/> Laboratory <input type="checkbox"/> Kitchen	<input type="checkbox"/> All transplant and intensive care units <input type="checkbox"/> All oncology units and other areas with severely immunocompromised patients <input type="checkbox"/> OR theaters and restricted areas <input type="checkbox"/> Procedural suites <input type="checkbox"/> Pharmacy compounding <input type="checkbox"/> Sterile processing department: Clean side <input type="checkbox"/> Transfusion services <input type="checkbox"/> Dedicated isolation units and isolation rooms <input type="checkbox"/> Imaging suites: invasive imaging <input type="checkbox"/> Dialysis unit

Describe key patient risks:

Step Three: Match the Patient Risk Group (Low, Medium, High, Highest) from Step Two with the planned Construction Activity Project Type (A, B, C, D, E) from Step One using the table below to find the Class of Precautions (I, II, III, IV or V) or level of infection control activities required. The activities are listed in the table below – Minimum Required Infection Control Precautions by Class.

Patient Risk Group	Construction Project Activity Type				
	TYPE A	TYPE B	TYPE C	TYPE D	TYPE E
LOW Risk	<input type="checkbox"/> I	<input type="checkbox"/> II	<input type="checkbox"/> II	<input type="checkbox"/> III*	<input type="checkbox"/> Exterior
MEDIUM Risk	<input type="checkbox"/> I	<input type="checkbox"/> II	<input type="checkbox"/> III*	<input type="checkbox"/> IV	
HIGH Risk	<input type="checkbox"/> I	<input type="checkbox"/> III	<input type="checkbox"/> IV	<input type="checkbox"/> V	
HIGHEST Risk	<input type="checkbox"/> III	<input type="checkbox"/> IV	<input type="checkbox"/> V	<input type="checkbox"/> V	

All construction and maintenance activities as defined in Step 1 require a permit and approval unless the work does not expose patients or employees and the ICRA Committee determines there is no appreciable risk to patients for acquired infection due to the project. Such decisions must be documented.

Environmental conditions that could affect human health, such as sewage, Mold, asbestos, gray water, and black water will require Class of Precautions IV for LOW and MEDIUM Risk Groups and Class of Precautions V for HIGH and HIGHEST Risk Groups.

Class III* Precautions - Type C [Medium Risk groups] and Type D [Low Risk Groups] work areas that cannot be sealed and completely isolated from occupied patient care spaces should be elevated to include negative air exhaust requirements as listed in Class IV Precautions.

Surrounding Area Assessment

Step Four: Assess potential risk to areas surrounding the project. Using the table below, identify the surrounding areas that will be affected and the type of impact that will occur. If more than one risk group is impacted, select the higher risk group using Step 2 - Patient Risk Group.

Unit Location:	Below	Above	Lateral	Behind	Front
Unit Name:					
Risk Group:					
Unit Contact:					
Phone:					
Email:					
Additional Controls:	<input type="checkbox"/> Noise <input type="checkbox"/> Vibration <input type="checkbox"/> Dust control <input type="checkbox"/> Ventilation <input type="checkbox"/> Pressurization	<input type="checkbox"/> Noise <input type="checkbox"/> Vibration <input type="checkbox"/> Dust control <input type="checkbox"/> Ventilation <input type="checkbox"/> Pressurization	<input type="checkbox"/> Noise <input type="checkbox"/> Vibration <input type="checkbox"/> Dust control <input type="checkbox"/> Ventilation <input type="checkbox"/> Pressurization	<input type="checkbox"/> Noise <input type="checkbox"/> Vibration <input type="checkbox"/> Dust control <input type="checkbox"/> Ventilation <input type="checkbox"/> Pressurization	<input type="checkbox"/> Noise <input type="checkbox"/> Vibration <input type="checkbox"/> Dust control <input type="checkbox"/> Ventilation <input type="checkbox"/> Pressurization
Impact on other systems, such as:	<input type="checkbox"/> Data <input type="checkbox"/> Mechanical <input type="checkbox"/> Med Gases <input type="checkbox"/> Water Systems	<input type="checkbox"/> Data <input type="checkbox"/> Mechanical <input type="checkbox"/> Med Gases <input type="checkbox"/> Water Systems	<input type="checkbox"/> Data <input type="checkbox"/> Mechanical <input type="checkbox"/> Med Gases <input type="checkbox"/> Water Systems	<input type="checkbox"/> Data <input type="checkbox"/> Mechanical <input type="checkbox"/> Med Gases <input type="checkbox"/> Water Systems	<input type="checkbox"/> Data <input type="checkbox"/> Mechanical <input type="checkbox"/> Med Gases <input type="checkbox"/> Water Systems
Notes:					

Were there discoveries in surrounding areas that would serve as cause to increase the class of precautions and necessitate additional controls? If so, please summarize.

NOISE AND VIBRATION ASSESSMENT

Type	Suggested Control Measures
<input type="checkbox"/> Drilling <input type="checkbox"/> Heavy Equipment <input type="checkbox"/> Motors <input type="checkbox"/> Pounding <input type="checkbox"/> Grinding <input type="checkbox"/> Other: Click or tap here to enter text.	<input type="checkbox"/> Required for high-impact activities – Notify PO&M, Building Coordinator and EH&S <input type="checkbox"/> Always consider using Engineering solutions before using Personal Protective Equipment. <input type="checkbox"/> Coordinate disruption plan with PO&M and other stakeholders as necessary <input type="checkbox"/> Deploy noise dampening blankets or other similar equipment <input type="checkbox"/> Use tools or alternative methods designed to minimize noise and vibrations <ul style="list-style-type: none"> <input type="checkbox"/> Use diamond drills instead of powder-actuated fasteners <input type="checkbox"/> Use beam clamps instead of shot <input type="checkbox"/> Prefab where possible <input type="checkbox"/> Use tin snips to cut metal studs instead of using a chop saw <input type="checkbox"/> Install metal decking with vent tabs, then use cellular floor deck hangers <input type="checkbox"/> Consider pro-press instead of soldering, brazing, or welding <input type="checkbox"/> Wet core drill instead of dry core or percussion <input type="checkbox"/> Instead of jackhammering concrete, use wet diamond saws <input type="checkbox"/> Use HEPA vacuums instead of standard wet/dry vacuums <input type="checkbox"/> Use mechanical joining system sprinkler fittings instead of threaded <input type="checkbox"/> Where fumes are tolerated, use chemical adhesive remover instead of mechanical <input type="checkbox"/> To remove flooring, shot blast instead of using a floor scraper <input type="checkbox"/> Use electric sheers instead of reciprocating saw for ductwork cutting. <input type="checkbox"/> Install exterior man/material lifts. <input type="checkbox"/> Provide staff and/or patients with noise-reducing protective equipment (e.g., ear plugs) <input type="checkbox"/> Relocate members/staff to another area of the facility for the duration of the activity <input type="checkbox"/> Notify affected areas before noise or vibration-producing activity <input type="checkbox"/> Schedule activities during hours that minimize patient, visitor, and staff impact. Hours: Click or tap here to enter text. <input type="checkbox"/> Other: Click or tap here to enter text.

AIR QUALITY IMPACT

Type	Suggested Control Measures
<input type="checkbox"/> Dust <input type="checkbox"/> Chemical (VOC) <input type="checkbox"/> Fugitive Emissions (Fumes) <input type="checkbox"/> Potential Mold <small>Note: If Mold is encountered, follow work practices outlined in the General Requirements Division 1 Section 01561 Document.</small> <input type="checkbox"/> Asbestos <input type="checkbox"/> Paint Solvent/Cleaner <input type="checkbox"/> Roofing Tar <input type="checkbox"/> Other: Click or tap here to enter text.	<input type="checkbox"/> Restrict/shut down air handlers for the duration of activity <input type="checkbox"/> Install temporary partitions <input type="checkbox"/> Install charcoal filters in HVAC or portable units <input type="checkbox"/> Install temporary ductwork and portable units <input type="checkbox"/> Prohibit idling of heavy equipment engines <input type="checkbox"/> Provide local exhaust ventilation <input type="checkbox"/> Substitute material with low VOC product <input type="checkbox"/> Notify area staff and EH&S before construction activity that may impact air quality <input type="checkbox"/> Provide negative pressure/HEPA filtration <input type="checkbox"/> Exhaust HEPA–99.97% to exterior <input type="checkbox"/> Relocate members/staff to another area of the facility for the duration of the activity <input type="checkbox"/> Schedule activities during hours that minimize patient, visitor, and staff impact. Hours: Click or tap here to enter text. <input type="checkbox"/> Provide Safety Data Sheets to EH&S for other recommended actions <input type="checkbox"/> Other: Click or tap here to enter text.

HAZARDOUS MATERIALS

A determination regarding the presence of hazardous materials in all UCDH buildings must be made before a project starts. This can be accomplished by existing surveys that identify the presence of hazardous materials or by hiring a consultant to perform a hazardous materials assessment of the areas that the project will impact. All impacted Hazardous Materials must be handled per the appropriate control measures.

Note: A Certified Asbestos Consultant must have conducted an asbestos survey before any demolition or renovation activity. There are no exceptions based on the date of construction or the facility's age.

ACKNOWLEDGEMENT OF HAZARDOUS MATERIALS

Does the project contact hazardous materials (e.g., asbestos, lead, mold, PCBs, mercury)?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
How was this verified?	<input type="checkbox"/> Hazmat Survey	<input type="checkbox"/> Personal Knowledge	
	<input type="checkbox"/> Other:		
Who verified this information?	<input type="checkbox"/> Company:		
	<input type="checkbox"/> Person and Department:		
	<input type="checkbox"/> Other:		
Hazardous Materials Present in Project Work Area	Required Control Measures		
<input type="checkbox"/> Asbestos <input type="checkbox"/> Lead <input type="checkbox"/> PCBs <input type="checkbox"/> Universal Waste <input type="checkbox"/> Other: Click or tap here to enter text.	Follow work practices outlined in the General Requirements Division 1 Document.		

CONTAINMENT REQUIREMENTS WORKSHEET

Containment Barrier	Where construction will impact fire-rated assemblies, the contractor is responsible for constructing interim assemblies and barriers that maintain the integrity of the structure's fire-rated system. Note: Interim Life Safety Measures may be required.		
	<input type="checkbox"/> Full Containment (poly over all surfaces within containment)		
	<input type="checkbox"/> The ceiling plenum within the work area shall be isolated and sealed by fire-rated six mil. poly		
	<input type="checkbox"/> Hard Barriers are recommended for work lasting greater than 30 days and in high-traffic areas.		
	<input type="checkbox"/> Fire retardant plastic barriers are recommended for work lasting less than 30 days. Plastic Barriers cannot be used where hot work will be performed.		
	<input type="checkbox"/> Isolated Room – Critical Openings Only (seal doors, supply and return registers, etc.)		
	<input type="checkbox"/> Prefabricated Containment Cube (only large enough for 1-2 people; aka pop-up cube or Mini Cube)		
	<input type="checkbox"/> Shrouded Tool with HEPA filtered exhaust		
<input type="checkbox"/> Glove Box Containment with HEPA filtered exhaust			
<input type="checkbox"/> Other:			
Negative Pressure	The contractor is required to maintain and document negative air pressure. DOP Tested HEPA-filtered negative air machines (with a minimum of 99.97% efficiency) and a rating of 200 to 2000 cubic feet per minute (CFM) is required for construction activities.		
	<input type="checkbox"/> -0.020" WC always displayed on a mounted digital manometer		
	<input type="checkbox"/> -0.020" WC at setup with negative pressure throughout the project as displayed on the manometer		
	<input type="checkbox"/> Visual Verification of some negative room pressure throughout the project		
	<input type="checkbox"/> No negative room pressure required		
	<input type="checkbox"/> Negative pressure in localized HEPA exhausted work area (e.g., shrouded tool, glove box)		
	<input type="checkbox"/> Additional Ante room under negative pressure		
<input type="checkbox"/> Other:			
Air Exhaust	<input type="checkbox"/> Air exhausted directly outside - Avoid exhausting air near air intakes or operable windows doors, and avoid exhausting air near walkways		
	<input type="checkbox"/> For air exhausted inside, check any of the following conditions that are required:		
	<input type="checkbox"/> Additional Filtration (ex. Charcoal, Diffuser system)		
	<input type="checkbox"/> Exhaust into Ducts/HVAC system – Mechanical engineer must confirm that exhausted air will not negatively impact the air balance of the existing system		
	<input type="checkbox"/> Onsite Challenge Testing (DOP or particle counting) before containment setup		
<input type="checkbox"/> Challenge Tested within last six months; Equipment has remained onsite at UCDH			
Additional Containment Requirements	<input type="checkbox"/> Ante Room	<input type="checkbox"/> Masonite Floor Protection	<input type="checkbox"/> Protective Clothing
	<input type="checkbox"/> Walk Off Mats	<input type="checkbox"/> Shoe Covers	<input type="checkbox"/> Collect Samples During Work
	<input type="checkbox"/> Other:		
Verification of Work	<input type="checkbox"/> HEPA Equipment Verification	<input type="checkbox"/> EH&S <input type="checkbox"/> Consultant <input type="checkbox"/> Other:	
	<input type="checkbox"/> Pre-Work Approval Inspection	<input type="checkbox"/> PM <input type="checkbox"/> EH&S <input type="checkbox"/> Consultant <input type="checkbox"/> IOR <input type="checkbox"/> Other:	
	<input type="checkbox"/> Daily Onsite Oversight	<input type="checkbox"/> PM <input type="checkbox"/> EH&S <input type="checkbox"/> Consultant <input type="checkbox"/> IOR <input type="checkbox"/> Other:	
	<input type="checkbox"/> Post Demolition/Abatement Inspection	<input type="checkbox"/> PM <input type="checkbox"/> EH&S <input type="checkbox"/> Consultant <input type="checkbox"/> IOR <input type="checkbox"/> Other:	
	<input type="checkbox"/> ICRA Downgrade	<input type="checkbox"/> PM <input type="checkbox"/> EH&S <input type="checkbox"/> Consultant <input type="checkbox"/> IOR <input type="checkbox"/> Other:	
	<input type="checkbox"/> Final Visual Containment Inspection	<input type="checkbox"/> PM <input type="checkbox"/> EH&S <input type="checkbox"/> Consultant <input type="checkbox"/> IOR <input type="checkbox"/> Other:	
	<input type="checkbox"/> Air Sampling	<input type="checkbox"/> EH&S <input type="checkbox"/> Consultant <input type="checkbox"/> Other:	
Air Sampling	<input type="checkbox"/> Particle Counting <input type="checkbox"/> Mold <input type="checkbox"/> Asbestos <input type="checkbox"/> Other:		Frequency:
Air Balance in Adjacent Areas:	The contractor is responsible for maintaining air balance in adjacent <u>high</u> and <u>highest-risk</u> areas per design/ASHRAE guidelines. Contact PO&M to verify the air balance requirements of surrounding areas.		
	Adjacent High/Highest Risk Areas		Air Balance Requirements
			Positive/negative pulldown

		Positive/negative pulldown
ICRA Permit Number		ICRA Class
23-00001		Choose an item.

Project Number:		Project Name:	
Impacted Department:	Building Number and Name:	Floor:	Suite/Room:
UCDH Project Manager:	UCDH PM Mobile Phone #:	UCDH PM Email:	
Construction Manager:	CM Mobile Phone:	CM Mobile Email:	
General Contractor:	General Contractor Mobile Phone:	General Contractor Mobile Email:	
Containment will be set up and maintained by:		Third-Party Containment Consultant:	

ICRA Class Choose an item.		Project Start Date	Completion Date
Additional Requirements			
Signatures	Project Manager	General Contractor	Infection Control and Prevention
Downgrade Request – ICRA Class Choose an item.		Project Start Date	Completion Date
Additional Requirements			
Signatures	Project Manager	General Contractor	Infection Control and Prevention
Extension Request – ICRA Class Choose an item.		Project Start Date	Completion Date
Additional Requirements			
Signatures	Project Manager	General Contractor	Infection Control and Prevention

INFECTION PREVENTION REQUIREMENTS - CLASS I

Prior to and During Construction:	<ul style="list-style-type: none"> • Perform noninvasive work activity as to not block or interrupt patient care. • Perform noninvasive work activities in areas that are not directly occupied with patients. • Perform noninvasive work activity in a manner that does not create dust. • Immediately replace any displaced ceiling tile before leaving the area and/or at end of noninvasive work activity.
Upon Completion of Work:	<p>Cleaning</p> <ul style="list-style-type: none"> • Clean work areas including all environmental surfaces, high horizontal surfaces and flooring materials. • Check all supply and return air registers for dust accumulation on upper surfaces as well as air diffuser surfaces. <p>HVAC Systems</p> <ul style="list-style-type: none"> • Remove isolation of HVAC system in areas where work is being performed. Verify that HVAC systems are clean and operational. • Verify the HVAC systems meet original airflow and air exchange design specifications.
	<p>Additional Infection Prevention Requirements:</p>

INFECTION PREVENTION REQUIREMENTS - CLASS II

Prior to and During Construction:	<ul style="list-style-type: none"> • Perform only limited dust work and/or activities designed for basic facilities and engineering work. • Perform limited dust and invasive work following standing precautions procedures approved by the organization. • This Class of Precautions must never be used for construction or renovation activities.
Upon Completion of Work:	<p>Cleaning:</p> <ul style="list-style-type: none"> • Clean work areas including all environmental surfaces, high horizontal surfaces, and flooring materials. • Check all supply and return air registers for dust accumulation on upper surfaces as well as air diffuser surfaces. <p>HVAC Systems:</p> <ul style="list-style-type: none"> • Remove isolation of the HVAC system in areas where work is being performed. Verify that HVAC systems are clean and operational. • Verify the HVAC systems meet original airflow and air exchange design specifications.
	Additional Infection Prevention Requirements:

INFECTION PREVENTION REQUIREMENTS - CLASS III

Prior to and During Construction:	<ul style="list-style-type: none"> • Provide active means to prevent airborne dust dispersion into the occupied areas. • Means for controlling minimal dust dispersion may include hand-held HEPA vacuum devices, polyethylene plastic containment, or isolation of work area by closing room door. • Remove or isolate return air diffusers to avoid dust from entering the HVAC system. • Remove or isolate the supply air diffusers to avoid positive pressurization of the space, • If work area is contained, then it must be neutrally to negatively pressurized at all times. *If negative pressure is required, see additional requirements below. • Seal all doors with tape that will not leave residue • Contain all trash and debris in the work area. • Nonporous/smooth and cleanable containers (with a hard lid) must be used to transport trash and debris from the construction areas. These containers must be damp-wiped cleaned and free of visible dust/debris before leaving the contained work area. • Install a sticky (dust collection) mat at entrance of contained work area based on facility policy. Sticky mats must be changed routinely and when visibly soiled. • Maintain clean surroundings when area is not contained by damp mopping or HEPA vacuuming surfaces. <p>Additional requirements for Class III containments that require negative pressure:</p> <ul style="list-style-type: none"> • Maintain negative pressurization of the entire workspace by use of HEPA exhaust air systems directed outdoors. Exhaust discharged directly to the outdoors that is 25 feet or greater from entrances, air intakes and windows requires the highest degree of filtration feasible. • If exhaust is directed indoors, then the system must be HEPA filtered. Prior to start of work, HEPA filtration must be verified by particulate measurement as no less than 99.97% efficiency and must not alter or change airflow/pressure relationships in other areas. • Exhaust into shared or recirculating HVAC systems, or other shared exhaust systems (e.g., bathroom exhaust) is not acceptable. • Install digital monitoring manometer with one thousandth of inch of water pressure (eg. - 0.024) exterior of work containment to continually monitor negative pressurization. The non-digital manometer monitors are not acceptable.
Upon Completion of Work:	<p>Cleaning:</p> <ul style="list-style-type: none"> • Clean work areas including all environmental surfaces, high horizontal surfaces, and flooring materials. • Check all supply and return air registers for dust accumulation on upper surfaces as well as air diffuser surfaces. <p>HVAC Systems:</p> <ul style="list-style-type: none"> • Remove isolation of the HVAC system in areas where work is being performed. Verify that HVAC systems are clean and operational. • Verify the HVAC systems meet original airflow and air exchange design specifications. <p>Class III precautions require inspection and documentation for downgraded ICRA precautions.</p> <p>Construction areas must be inspected by the designee on the containment requirements worksheet for discontinuation or downgrading of ICRA precautions.</p> <p>Work Area Cleaning:</p>

- Clean work areas including all environmental surfaces, high horizontal surfaces and flooring materials.
- Check all supply and return air registers for dust accumulation on upper surfaces as well as air diffuser surfaces.

Removal of Critical Barriers:

- Critical barriers must remain in place during all work involving drywall removal, creation of dust and activities beyond simple touch-up work. The barrier may NOT be removed until a work area cleaning has been performed.
- All (plastic or hard) barrier removal activities must be completed in a manner that prevents dust release. Use the following precautions when removing hard barriers:
 - Carefully remove screws and painter tape.
 - If dust will be generated during screw removal, use hand-held HEPA vacuum.
 - Drywall cutting is prohibited during removal process.
 - Clean all stud tracks with HEPA vacuum before removing outer hard barrier.
 - Use a plastic barrier to enclose area if dust could be generated.

Negative Air Requirements:

- The use of negative air must be designed to remove contaminants from the work area.
- Negative air devices must remain operational at all times and in place for a period after completion of dust creating activities to remove contaminants from the work area and before removal of critical barriers.

HVAC systems:

- Upon removal of critical barriers, remove isolation of HVAC system in areas where work is being performed.
- Verify that HVAC systems are clean and operational.
- Verify the HVAC systems meets original airflow and air exchange design specifications.

Additional Infection Prevention Requirements:

INFECTION PREVENTION REQUIREMENTS - CLASS IV

Prior to and During Construction:

- Construct and complete critical barriers meeting NFPA 241 requirements. Barriers must extend to the ceiling or if ceiling tile is removed, to the deck above.
- All (plastic or hard) barrier construction activities must be completed in a manner that prevents dust release. Plastic barriers must be effectively affixed to ground and ceiling and secure from movement or damage. Apply tape that will not leave a residue to seal gaps between barriers, ceiling or floor.
- Seal all penetrations in containment barriers, including floors and ceiling, using approved materials (UL schedule firestop if applicable for barrier type).
- Containment units or environmental containment units (ECUs) approved for Class IV precautions in small areas totally contained by the unit and that has HEPA-filtered exhaust air (MiniCube Mobile Containments).
- Remove or isolate return air diffusers to avoid dust entering the HVAC system.
- Remove or isolate the supply air diffusers to avoid positive pressurization of the space.
- Negative airflow pattern must be maintained from the entry point to the anteroom and into the construction area. The airflow must cascade from outside to inside the construction area. The entire construction area must remain negatively pressurized.
- Maintain negative pressurization of the entire workspace by use of HEPA exhaust air systems directed outdoors. Exhaust discharged directly to the outdoors that is 25 feet or greater from entrances, air intakes and windows requires the highest degree of filtration feasible.
- If exhaust is directed indoors, then the system must be HEPA filtered. Prior to start of work, HEPA filtration must be verified by particulate measurement as no less than 99.97% efficiency and must not alter or change airflow/pressure relationships in other areas.
- Exhaust into shared or recirculating HVAC systems, or other shared exhaust systems (e.g., bathroom exhaust) is not acceptable.
- Install digital monitoring manometer with one thousandth of inch of water pressure (eg. - 0.024) exterior of work containment to continually monitor negative pressurization. The non-digital manometer monitors are not acceptable.
- Contain all trash and debris in the work area.
- Nonporous/smooth and cleanable containers (with a hard lid) must be used to transport trash and debris from the construction areas. These containers must be damp-wiped cleaned and free of visible dust/debris before leaving the contained work area.
- Worker clothing must be clean and free of visible dust before leaving the work area. HEPA vacuuming of clothing or use of cover suites is acceptable.
- Workers must wear shoe covers prior to entry into the work area. Shoe covers must be changed prior to exiting the anteroom to the occupied space (non-work area). Damaged shoe covers must be immediately changed.
- Install a sticky (dust collection) mat at entrance of contained work area based on facility policy. Sticky mats must be changed routinely and when visibly soiled.
- Collection of particulate data during work may be collected to assure that contaminants do not enter the occupied spaces. Routine collection of particulate samples may be used to verify HEPA filtration efficiencies. Collection of particulate data may be collected by Environmental Health and Safety or approved third party consultant.

Class IV precautions require inspection and documentation for downgraded ICRA precautions.

Construction areas must be inspected by the designee on the containment requirements worksheet for discontinuation or downgrading of ICRA precautions.

Work Area Cleaning:

- Clean work areas including all environmental surfaces, high horizontal surfaces and flooring materials.
- Check all supply and return air registers for dust accumulation on upper surfaces as well as air diffuser surfaces.

Removal of Critical Barriers:

- Critical barriers must remain in place during all work involving drywall removal, creation of dust and activities beyond simple touch-up work. The barrier may NOT be removed until a work area cleaning has been performed.
- All (plastic or hard) barrier removal activities must be completed in a manner that prevents dust release. Use the following precautions when removing hard barriers:
 - Carefully remove screws and painter tape.
 - If dust will be generated during screw removal, use hand-held HEPA vacuum.
 - Drywall cutting is prohibited during removal process.
 - Clean all stud tracks with HEPA vacuum before removing outer hard barrier.
 - Use a plastic barrier to enclose area if dust could be generated.

Negative Air Requirements:

- The use of negative air must be designed to remove contaminants from the work area.
- Negative air devices must remain operational at all times and in place for a period after completion of dust creating activities to remove contaminants from the work area and before removal of critical barriers.

HVAC systems:

- Upon removal of critical barriers, remove isolation of HVAC system in areas where work is being performed.
- Verify that HVAC systems are clean and operational.
- Verify the HVAC systems meets original airflow and air exchange design specifications.

Additional Infection Prevention Requirements:

INFECTION PREVENTION REQUIREMENTS - CLASS V

Prior to and During Construction:

- Construct and complete critical barriers meeting NFPA 241 requirements. Barriers must extend to the ceiling or if ceiling tile is removed, to the deck above.
- All (plastic or hard) barrier construction activities must be completed in a manner that prevents dust release. Plastic barriers must be effectively affixed to ground and ceiling and secure from movement or damage. Apply tape that will not leave a residue to seal gaps between barriers, ceiling or floor.
- Seal all penetrations in containment barriers, anteroom barriers, including floors and ceiling using approved materials (UL schedule firestop if applicable for barrier type).
- Construct anteroom large enough for equipment staging, cart cleaning, workers. The anteroom must be constructed adjacent to entrance of construction work area.
- Personnel will be required to wear coveralls at all times during Class V work activities. Coveralls must be removed before leaving the anteroom.
- Remove or isolate return air diffusers to avoid dust entering the HVAC system.
- Remove or isolate the supply air diffusers to avoid positive pressurization of the space.
- Negative airflow pattern must be maintained from the entry point to the anteroom and into the construction area. The airflow must cascade from outside to inside the construction area. The entire construction area must remain negatively pressurized.
- Maintain negative pressurization of the entire workspace by use of HEPA exhaust air systems directed outdoors. Exhaust discharged directly to the outdoors that is 25 feet or greater from entrances, air intakes and windows requires the highest degree of filtration feasible
- If exhaust is directed indoors, then the system must be HEPA filtered. Prior to start of work, HEPA filtration must be verified by particulate measurement as no less than 99.97% efficiency and must not alter or change airflow/pressure relationships in other areas.
- Exhaust into shared or recirculating HVAC systems, or other shared exhaust systems (bathroom exhaust) is not acceptable.
- Install digital monitoring manometer with one thousandth of inch of water pressure (eg. -0.024) exterior of work containment to continually monitor negative pressurization. The non-digital manometer monitors are not acceptable.
- Contain all trash and debris in the work area.
- Nonporous/smooth and cleanable containers (with a hard lid) must be used to transport trash and debris from the construction areas. These containers must be damp-wiped cleaned and free of visible dust/debris before leaving the contained work area.
- Worker clothing must be clean and free of visible dust before leaving the work area anteroom.
- Workers must wear shoe covers prior to entry into the work area. Shoe covers must be changed prior to exiting the anteroom to the occupied space (non-work area). Damaged shoe covers must be immediately changed.
- Install a sticky (dust collection) mat at entrance of contained work area based on facility policy. Sticky mats must be changed routinely and when visibly soiled.
- Collection of particulate data during work may be collected to assure that contaminants do not enter the occupied spaces. Routine collection of particulate samples may be used to verify HEPA filtration efficiencies. Collection of particulate data may be collected by Environmental Health and Safety or approved third party consultant.

Class IV precautions require inspection and documentation for downgraded ICRA precautions.

Construction areas must be inspected by the designee on the containment requirements worksheet for discontinuation or downgrading of ICRA precautions.

Work Area Cleaning:

- Clean work areas including all environmental surfaces, high horizontal surfaces and flooring materials.
- Check all supply and return air registers for dust accumulation on upper surfaces as well as air diffuser surfaces.

Removal of Critical Barriers:

- Critical barriers must remain in place during all work involving drywall removal, creation of dust and activities beyond simple touch-up work. The barrier may NOT be removed until a work area cleaning has been performed.
- All (plastic or hard) barrier removal activities must be completed in a manner that prevents dust release. Use the following precautions when removing hard barriers:
 - Carefully remove screws and painter tape.
 - If dust will be generated during screw removal, use hand-held HEPA vacuum.
 - Drywall cutting is prohibited during removal process.
 - Clean all stud tracks with HEPA vacuum before removing outer hard barrier.
 - Use a plastic barrier to enclose area if dust could be generated.

Negative Air Requirements:

- The use of negative air must be designed to remove contaminants from the work area.
- Negative air devices must remain operational at all times and in place for a period after completion of dust creating activities to remove contaminants from the work area and before removal of critical barriers.

HVAC systems:

- Upon removal of critical barriers, remove isolation of HVAC system in areas where work is being performed.
- Verify that HVAC systems are clean and operational.
- Verify the HVAC systems meets original airflow and air exchange design specifications.

Additional Infection Prevention Requirements:

INFECTION PREVENTION REQUIREMENTS – EXTERIOR

Prior to and During Construction:	<ul style="list-style-type: none"> • Identify and confirm fugitive fume and dust control measures are in place prior to work starting i.e., charcoal filters at air intakes, scrubbers on equipment etc. • Contractor must submit an excavation and trenching plan for review and implementation. • Install fencing, physical barriers and interior/exterior signage to re-direct pedestrian and vehicular traffic as necessary. • If locally required, validate soil survey was performed to identify potential contaminants (e.g., valley fever, radon, legionellosis, etc.). • Ensure that fugitive dust control measures are adhered to (e.g., work area is kept wet). • Validate those fumes created by equipment and material is controlled. <ul style="list-style-type: none"> o If required, install charcoal filters on air intake to building. o Maintain equipment exhaust scrubbers if working near sensitive areas or near air-intake o Minimize equipment idling • Validate barriers restricting access and signage into construction work areas are maintained.
Upon Completion of Work:	<ul style="list-style-type: none"> • Ensure all control measures are removed at completion of project.
	Additional Infection Prevention Requirements:

SECTION 01 56 20

REQUIREMENTS FOR CEILING ACCESS TO SPACES CONTAINING ASBESTOS

PART I - GENERAL

1.01 SECTION INCLUDES

- A. 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.
- B. 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 California Code of Regulations, Title 8, Section 1529. 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 II - Not applicable to this section

PART III - EXECUTION

3.01 Training

- A. 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. This training shall adhere to requirements as set forth in 40 CFR 763.92(a)(2).

3.02 Competent Person

- A. 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. The Competent Person shall adhere to all requirements within their area of responsibility outlined in 8 CCR 1529.

3.03 Standard Access/Egress Procedures from Mini-Enclosure

- A. 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. All mini-enclosures and HEPA vacuums must be re-certified by a third-party using DOP testing every 6 months.

- B. Disposable full body coveralls are required in all ICRA Class III and IV containment areas dealing with asbestos or presumed asbestos 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.
- C. Proper use of the disposable coveralls and use of the sticky mat shall be followed at all times for all workers and University 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 labeled, secured, plastic asbestos waste bag before leaving the mini-enclosure.

3.04 Air Sampling

- A. Air sampling is required per 8 CCR 1529 to assess asbestos exposures when the project requires workers to enter the attic space if there is a reasonable possibility that the permissible exposure limit (PEL) may be exceeded. 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.

3.05 Debris Clean-up

- A. 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. These techniques of minimizing asbestos fiber migration are outlined in 8 CCR 1529 and are to be strictly adhered to.

3.06 Personal Protective Equipment

- A. All personnel entering the attic space with known or presumed asbestos containing materials shall wear full body disposable coveralls (e.g., Tyvek, Kleenguard or equivalent) and at a minimum, a half face, tight fitting, elastomeric respirator with HEPA (P-100) filter cartridges for asbestos protection (or a respirator offering greater protection). The individual wearing this respirator must have been fit tested, trained and had medical clearance, pursuant to 8 CCR 5144.

3.07 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 asbestos will likely not be disturbed).

- A. Control of disturbance of asbestos debris during work inside of an attic space 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:
 - a. dry sweeping is not permitted
 - b. employees must not walk on, crawl on or otherwise crush visible suspect asbestos containing debris
 - c. the control method must not result in a release of airborne fibers.

- B. 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.
- 3.08 HEPA Filter Challenge Testing and Certification
- A. 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 University building.
- 3.09 Access for Inspection after Ceiling Tile has been Removed
- A. 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 which materials in the area contain asbestos.
- 3.10 Asbestos Waste Management
- A. 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 (Site address and Generator Number will change with each project site location) The Generator is UC Davis Health EPA ID No. CAD076124981. The Generator address is 2315 Stockton Blvd., FSSB 2500, Sacramento, CA 95817.
 - B. For those projects generating five (5) or fewer bags of asbestos-contaminated materials, University 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.
 - C. 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 the University EH&S. Contact EH&S with at least one week's notice of the intent to dispose.

END OF SECTION 01 56 20

SECTION 01 61 00

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 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- B. Section 013900 - GREEN BUILDING POLICY IMPLEMENTATION
- C. Section 014100 – REGULATORY REQUIREMENTS
- D. Section 014500 – 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 014500 – QUALITY CONTROL and other Sections in Division 2 through 49 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" 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) calendar days after the date of commencement of the Work specified in the Notice to Proceed, a list in excel format containing Specification Section number with extension i.e. 088000 2.B.1.a. with 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 sixty (60) calendar 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 sixty (60) calendar 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 sixty (60) calendar 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's Representative 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 ONE (1) PDF file with bookmarks.
 - b. In reviewing supporting data for substitution, University will use, for purpose of comparison, all characteristics of Basis of Design 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. Provide a Comparison Table as part of the substitution request listing the design and performance criteria of the Basis of Design specified product with the proposed substitution product side by side. The design and performance criteria shall include but not limited to; size, thickness, gauge, strength, function, ASTM rating, test report data, manufacturing association standards & data, technical properties & performance data, traffic or weather resistance, quality assurance data, warranty and other design and performance criteria list in Basis of Design manufactures specification and written material.
 4. Furnish list of Subcontractors, if any, that may be affected by the substitution.
 5. 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.
 6. 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.

7. 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.

3.02 Refer to the following Attachment:

- A. Request for Substitution Form.

END OF SECTION 01 61 00

REQUEST FOR SUBSTITUTION

Substitution #: _____ Submittal #: _____ Date: _____

Project#: _____ HCAI#: _____

PROJECT NAME: _____

TO: UC DAVIS HEALTH Facilities Design & Construction 4800 2 ND Avenue, Suite 3010 Sacramento, CA95817 P: 916-734-7024 Attn.: <u>calubawy@ucdavis.edu</u>	FROM: _____ _____ _____ _____ _____ _____
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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): _____

<p>PRODUCT DATA: ATTACH PRODUCT DATA AS SPECIFIED IN SPECIFICATION SECTION 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES</p> <p>Similar projects using product (list dates of installation and names/phone numbers of Owners):</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Similar comparison of proposed substitution with specified product (indicate variation(s), and reference each variation to appropriate Specification Section paragraphs):</p> <p>-ATTACH COMPARISON SUMMARY-</p>

(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 01 72 00

PREPARATION

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Surveying and Field Engineering Services

1.02 RELATED SECTIONS

- A. Section 01 45 00 – QUALITY CONTROL
- B. Section 01 78 00- CLOSEOUT SUBMITTALS

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. For work that connects to existing structures with new floors or roofs that align with existing conditions; **Contractor** shall verify new and existing elevations prior to constructing the new floor or roof structure. Adjust elevations accordingly so that the new and existing floors are level and lineup.
 - 1. University approval in writing is required for any deviations from the contract documents intent.
- D. 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.
- C. All control points established for the project must be clearly shown on the record documents.

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 Including but not limited to items indicated in 3.03, B. and 3.04, B.
- B. On completion of foundation walls, underground utilities and major site improvements, prepare certified survey showing all dimensions, locations, angles and elevations of construction. Provide as part of the As-Built Documents per Section 01 78 00.

END OF SECTION 01 72 00

SECTION 01 73 00
CUTTING AND PATCHING

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching Work.
- B. Hazardous Conditions Permit requirements for brazing, welding and other hot work.

1.02 RELATED SECTIONS

- A. Section 011100 – SUMMARY OF THE WORK
- B. Section 013100 – COORDINATION
- C. Section 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- D. Section 015610 – AIRBORNE CONTAMINANTS CONTROL
- E. Section 016100 – PRODUCT REQUIREMENTS
- F. 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) calendar 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 Project 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/>. **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 HCAI 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 013500 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 016100 – PRODUCT REQUIREMENTS. Use only materials for cutting, fitting, and patching which comply with the applicable Specification Sections, and which match adjacent materials. Use materials whose installed performance will equal or surpass that of existing materials.

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.
- C. Protection. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas. Do not block required exit ways or stairs.
- E. Protect rated floor, wall and ceiling assemblies. Prior to cutting opening in a rated assemblies review with University's Representative and get written approval from the Fire Marshal.

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.
- F. Provide cutting and patching to accommodate all demolition work as part of this contract. Provide level and plumb cuts at locations that will be exposed or to provide smooth and even surface for patching to existing work or surfaces.
- G. Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

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. Do not over saw cut corners and intersection unless written authorization is provided from the University Representative and the Structural Engineer of Record.
- 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 workday. Closures shall be approved by the University Fire Marshal.
- G. Refinish surface to match adjacent finish. For continuous surfaces, refinish to nearest intersection, corner or natural break and from floor to ceiling. For an assembly, refinish unit. All patched surfaces from new to existing shall provide a smooth and even transitions aligning with the adjacent surface with no visible marks, joints, seams, sheen, texture or color difference.
- 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.
- I. Visual Requirements: Do not cut and patch operating elements or related components in a manner that would, in the University's Representative's opinion, reduce the building's

aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner, including by not limited to.

1. Repair and patch in areas where finishes have been visually disturbed by cutting and patching to the nearest intersections.
2. Processed concrete finishes
3. Firestopping
4. Acoustical ceilings
5. Flooring
6. Carpeting

3.05 Refer to the Following Attachment

- A. Coring/Sawcutting Notification

END OF SECTION 01 73 00

CORING/SAWCUTTING NOTIFICATION

LOCATION: 4301 X St, Sacramento, CA 95817 PROJECT#: 22043
TITLE: MAIN HOSP Radiology CT Site Trailer Project

TRACKING NUMBER: _____
(Provided by PO&M)

HCAI #: _____ DATE: _____

TO: Facilities Design & Construction UC Davis Health 4800 2nd Avenue, Suite 3010 Sacramento, CA 95817 P: 916-734-7024 <u>calubawy@ucdavis.edu</u>	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>UC DAVIS HEALTH USE ONLY</u>	
DATE RECEIVED: _____	
WHO FROM UNIVERSITY WILL AUTHORIZE, SUPERVISE AND VERIFY? PHONE: _____	
Utilities Verified by IOR? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Activities coordinated with: <input type="checkbox"/> PO&M <input type="checkbox"/> Fire <input type="checkbox"/> Telecom <input type="checkbox"/> Occ. Safety <input type="checkbox"/> 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 74 00

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 015610 Airborne Contaminants Control have procedures and practices that shall be implemented and followed by the Contractor for this project.
- D. Section 013900 Green Building Policy Implementation: Waste Management Program

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.
 - a. All horizontal surfaces above ceilings shall be cleaned prior to ceiling closer.
 3. After every concrete placement clean all wet concrete from all surfaces.
 - a. Interior and exterior
 4. 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.
 5. Broom clean with sweeping compound or HEPA Vacuum interior areas prior to start of surface finishing, and continue cleaning on an as needed basis.
 6. Control cleaning operations so that dust and other particles will not adhere to wet or newly coated surfaces.
 7. Provide a mat, as specified above, for project entrances and exits. Mat 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.
 8. Any dust or debris tracked out of the construction site, either by foot traffic or by debris hauling vehicles shall be cleaned by the contractor. If the dirt or other debris is determined by the University's Representative to be from the contractor's activities at the jobsite it shall be cleaned in a timely manner regardless of how far from the site it is.
- B. Conduct cleaning and disposal operations in compliance with Waste Management Program per 013900 and 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. At roof areas remove all unused materials and construction waste including but not limited to screws, nails, fasteners, sheet metal cuttings, scrapes, oil, grease and adhesive. Wash down roof horizontal and vertical surfaces. Clean out all debris at roof drains.
- C. Clean walkways, driveways and streets by thorough brooming and wash-down.
- D. Clear debris from storm drainage lines and ways, leaving site ready for stormy weather.
- E. Rake landscaped areas clean.
- F. Remove waste and surplus materials, rubbish and temporary construction facilities, utilities and controls.
- G. Disinfect containment and protection areas as directed by University Representative.
- H. 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 the following but not limited to concrete splatters, paint splatters, pencil marks, pen marks, chalkline marks, tape, protective films & coatings, 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.
- I. Cleaning of Work provided by University under separate contracts, will not be required except if soiled by construction activities under this Contract.
- J. Thoroughly clean and polish all resilient flooring, metal and plastic surfaces; remove labels and protective coatings.
- K. Replace filters and clean heating and ventilating equipment used for temporary heat and ventilation.
- L. 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.

- M. 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. Power Wash, 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 Beneficial Occupancy, Substantial Completion or Final Completion; 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 01 74 00

SECTION 01 75 00
STARTING AND ADJUSTING SYSTEMS

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for Starting Systems

1.02 RELATED SECTIONS

- A. Section 018100 – PLUMBING/HVAC TESTING PROCEDURES
- B. Section 018200 – DEMONSTRATION AND TRAINING
- C. Section 019100 - COMMISSIONING
- D. Division 22
- E. Division 23
- F. Division 25
- G. Division 26
- H. Division 27

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 ninety (90) calendar days prior to any start-up.
 - 1. Start up, testing and Commissioning of equipment shall be integrated and coordinated with the contract schedule.
 - a. Adjustments will be made as project progresses, but the sequencing will be maintained.
- B. Submit manufacturer's representative reports within one (1) week after start-up, listing satisfactory start-up dates.
- C. Provide information, manufacturer and model number of all testing equipment to be used and current certification that the testing equipment has been calibrated within the last 6 months.
- D. Maintain log with dates and results of Starting and Adjustments, and provide electronic copy to University's Representative.

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.
- D. Permanent Power is connected and operational to the building.

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. **Contractor** Quality Assurance Manager shall take the lead role for Starting and Adjusting the equipment; coordinate and work with the University's Representative and Inspectors throughout the entire process.
 - 1. Coordinate all start-up with the Commissioning Agent for the project.
- D. Information on hand: Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during entire start-up process.
- E. Verify each piece of equipment is anchored correctly per the manufacturer's requirements and the Contract Documents prior to energizing or starting.
- F. Verify each piece of equipment is connected to the correct power source, the breaker and conductors are the correct size. Overcurrent protection in place and required shut offs adjacent to the equipment are in place.
- G. Verify each piece of equipment has been checked for proper lubrication, drive rotation, belt tension, control sequence, and other conditions that may cause damage prior to energizing or starting.
- H. Verify control systems are fully operational in automatic mode.
- I. Manufacturer's Criteria: Verify tests, meter readings and specific electrical characteristics agree with electrical equipment manufacturers' criteria.
- J. Bearings: Inspect for cleanliness: clean and remove foreign matter, verify alignment. Take corrective action as required.

- K. 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. Verify shaft grounding protection is in place.
- L. 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. Verify shaft grounding protection is in place.

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 and the contract schedule.
- C. Follow manufacturer's requirements and recommendations for Starting and Adjusting, including any University requirements that may be listed in the Contract and Construction Documents.
- D. Equipment manufacturers representatives shall be on site for Starting and Adjusting that equipment.
- E. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- F. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- G. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 01 75 00

SECTION 01 76 00

PROTECTION of EXISTING and INSTALLED CONSTRUCTION

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Protection for Products Including University Provided Products, After Installation.
- B. Protection of Existing Utilities, Interference and Underground Structures.
- C. Protection of Existing Structures and Work adjacent to new construction and demolition.

1.02 RELATED SECTIONS

- A. Section 013100 – COORDINATION
- B. Section 013900 – GREEN BUILDING POLICY IMPLEMENTATION
- C. Section 015100 – 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. As part of the Contract Work the investigation and excavation to locate existing utilities and underground structures shall be as follows, Contractor shall assume the existing known utility is within a 5 feet zone on either side of the location indicated on the Contract Documents. If the existing known utility is not located within a 5 feet zone on either side of the location indicated on the Contract Documents, the Contractor shall immediately notify the Universities Representative. The Contractor shall continue excavating until the existing utility is located. The Contractor shall be compensated for any additional excavation beyond the 5 feet zone on either side of the existing utility per 1.03D.
- C. **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.

- D. 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.
- E. 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.
- F. 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.
- G. 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 areas, 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. Protect the elevator call buttons, switches, communication devices, lights, thresholds and other components.
- F. Moisture and Humidity Protection: Protect all new installed work and existing work per the manufacturer's requirements from moisture or humidity damage including but not limited to stored materials, finishes, gypsum board, insulation, doors, casework, millwork, equipment and all other building components.
- G. 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. At all transitions to adjacent areas not under construction.
 3. Lay rigid materials in place in areas subject to movement of heavy objects and where storage of products will occur.
- H. 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.
 3. No Construction work shall be conducted on any unprotected roof weather new or existing.
 4. All pathways to work on the roof shall be protected.
- I. Lawns and Landscaping: Restrict traffic of any kind across planted lawn and landscaped areas.
- J. Adjacent Facilities: Care shall be exercised to prevent damage to adjacent facilities including walks, curbs, and gutters. Adequate protection 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.

3.02 Protection of Existing Structure and Work adjacent to new construction and demolition.

- A. The **Contractor** shall protect existing in place work at the exterior and interior, including but not limited to finishes, materials, products, utilities, fixtures, and equipment adjacent to new construction and demolition. Any existing in place work at the exterior and interior that is damaged by the **Contractor** shall be repaired or replaced at no extra cost to the University.
- B. 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.
- C. 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.
- D. 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.
- E. 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.

- F. 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.
- G. Protective Coatings: Remove protective coatings, etc., as required to leave work in condition for painting and finishing, final cleaning, etc.
- H. Exterior Work: Protect all exterior work, including existing asphalt paving and landscaping and buildings.

END OF SECTION 01 76 00

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Project Closeout Procedures
- B. Contract Closeout Procedures
- C. Punch List of Incomplete Work or Corrections

1.02 RELATED SECTIONS

- A. Section 013100 – COORDINATION
- B. Section 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:
Administrative general requirements for submittals.
- C. Section 013900 – GREEN BUILDING POLICY IMPLEMENTATION
- D. Section 015600 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS:
Removal of Controls.
- E. Section 017400 – CLEANING: Final Cleaning.
- F. Section 017800 – 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. Notify the University's Representative fourteen (14) calendar days prior to the Project being ready for permanent cores and keying.
- D. Complete start-up testing and Commissioning 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:
1. **Contractor** shall provide an electronic file as indicated in Item 1.04, C., (Preliminary Punch List) of items not installed, to be completed, not functioning correctly or to be corrected. The list shall include the anticipated dates of when the work is to be installed, completed or corrected.
 2. Organize the List per Item 1.04, C.
 3. 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).
 4. Segregate architectural, plumbing, HVAC and electrical Work on separate lists.
 5. 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 commissioned, tested, adjusted and balanced and are fully operational.
 - e. Indicate Operation of systems that have been demonstrated to University personnel and which systems have not been demonstrated to University personal.
 - f. Work is ready for University's Consultant's Substantial Completion review.
 2. Provide minimum fourteen (14) calendar days' notice to University's Representative prior to desired date for Punch List review.

- C. Organization of List (Punch List):
1. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by **Contractor** that are outside the limits of construction.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Format Requirements: Provide the following:
 - a. Organized electronic file that is able to be filtered or queried by the following categories:
 - 1) Contractor or Subcontractor
 - 2) Building Area/Floor if applicable
 - 3) Room Number or specific interior or exterior area.
 - 4) Photo Number if applicable
 - 5) Open or Closed
 - 6) Columns for use by University's Representative
 - a) Responsible Design Consultant
 - 7) Comments
 - b. Other Punchlist Software may be used if approved by the University's Representative.
 - c. Include the following information at the top of each page:
 - 1) Project name and Number.
 - 2) Date.
 - 3) Name of University's Representative.
 - 4) Name of **Contractor**.
 - 5) Page number.
- D. 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 edit the electronic file 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.
- E. **Uncorrected Work:** Refer to requirements specified in SECTION 014500 – QUALITY CONTROL regarding Contract adjustments for non-conforming work.
- F. **Cleaning and Clearing:** Prior to Substantial Completion review, execute cleaning and clearing site of temporary facilities and controls, as specified in SECTION 015600 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS and SECTION 017400 CLEANING
- G. **Testing and Inspection:** Prior to Substantial Completion review, complete all tests and inspections and submit applicable reports and approvals. Provide commissioning of building systems per Section 013900 GREEN BUILDING POLICY IMPLEMENTATION.
1. Complete materials tests and inspections.
 2. Complete commissioning, testing, inspection, balancing, sterilization and cleaning of plumbing and HVAC systems.
 3. Complete commissioning, testing and inspection of electrical system.
 4. Complete commissioning and operational tests of equipment.
 5. IF HCAI PROJECT: Submit electronic file of **Contractor's** Final HCAI 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 SUBMITALS (See 017800 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 (Mark as NOT USED if not project applicable.)
 4. Changes under unit prices (Mark as NOT USED if not project applicable.)
 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 012900 – MEASUREMENT AND PAYMENT and the General Conditions of the Contract.
- B. Submit As-Built Documents to University's Representative with final Application for Payment.

PART II - PRODUCTS – Not Applicable to this Section

PART III - PART III - EXECUTION

3.01 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

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

3.02 REPAIR PERIOD (GUARANTEE OR WARRANTY PERIOD)

- A. Upon acceptance of the project or a portion thereof from the **Contractor**, the "Guarantee to Repair Period" of one year or more will begin as described in Article 9 of the General Conditions. The University Representative will become responsible for receiving notices of Defective Work from building occupants and securing **Contractor** compliance where applicable. The University Representative shall have prime responsibility for follow-up & monitoring of **Contractor** activities. (Refer to Article 12 of General Conditions).
1. If the **Contractor** must "Shut-down" the fire and security alarms in an occupied building, then the **Contractor** shall be responsible to provide a fire and security watch until the system, at no additional cost to the University.

END OF SECTION 01 77 00

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Equipment Data
- B. Operation and Maintenance Instructions
- C. Instruction of University 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 013100 – COORDINATION
- B. Section 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- C. Administrative general requirements for submittals.
- D. Section 013900 – GREEN BUILDING POLICY IMPLEMENTATION
- E. Section 014500 – QUALITY CONTROL: Manufacturer's tests and inspections as a condition of warranty.
- F. Section 014550 – INSPECTION AND TESTING OF WORK
- G. Section 016100 – PRODUCT REQUIREMENTS
- H. Section 017700 – CLOSEOUT PROCEDURES

1.03 FILE FORMATS

- A. All printed documents submitted per this section shall be in PDF format
 - 1. The PDF files will be unlocked and searchable.
 - 2. All PDF documents will be bookmarked.
 - 3. The exception to electronic format for As-Built drawings will be noted in the specific specification section where they are required.
- B. Digital Photography
 - 1. All files will be submitted in JPEG

1.04 EQUIPMENT DATA AND OPERATION AND MAINTENANCE (O&M) 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. O&M Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at time of Section Submittals. Submit reviewed manual content formatted and organized as required by this Section. Prepare in the form of a data and instructional manual.
- C. Submit PDF electronic files of operation and maintenance manuals. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to the University. The exception to electronic format will be indicated in the specific specification section requiring hard copies of the manual.
1. Name each indexed document file in composite electronic index with applicable item name. Include a completed electronically linked operation and maintenance directory.
 - a. List Project title and Project number and particular building as applicable.
 - b. Enable inserted reviewer comments on draft submittals.
 2. Organization: Arrange content by systems under Section numbers and sequence in accordance with the Project Specifications Table of Contents.
- D. 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 As-Builts 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 014500 – QUALITY CONTROL.
 5. Warranties and Bonds: Include in each applicable section.

E. Manual for Materials and Finishes:

1. Building Products, applied Materials, and Finishes: Provide PDF composite electronically indexed file. 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 PDF electronic file with links to individual sections.

F. 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 PDF composite electronically indexed file 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. Submit drafts for review before preparing final PDF electronic file.
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 shall be updated to 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 troubleshooting; 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.
 14. Additional Requirements: As specified in individual Specification Sections.
- G. 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.
- H. Equipment Data and Operation and Maintenance Instructions Submittals:
1. Submittals: Comply with administrative requirements specified in SECTION 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
 2. Preliminary Draft O&M Submittal: Submit electronic files of each manual at least **[180]** calendar days before commencing demonstration and training. University's Representative will review draft and return with comments.
 - a. The comments or corrections shall be incorporated into the Final O&M submittal.
 - b. Correct or revise each manual to comply with the University's Representatives comments. Submit electronic copies of each corrected manual within **[15]** calendar days of receipt of University's Representative's comments.
 - c. University's Representative will notify the **Contractor** when the edits have been accepted for incorporation into the final O&M submittal.
 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 O&M 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 each

manual in the final form prior to requesting inspection for Substantial Completion. The University's Representative will return comments electronically.

- a. Submit electronic copies of each manual prior to requesting training.

1.05 SPARE PARTS, EXTRA STOCK 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.
 3. Provide itemized list of all spare parts, materials and transmittal to the University's Representative for acceptance.
- B. Storage, maintenance: Store products with products to be installed in the Work, as specified in SECTION 016100 – 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.

1.06 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 1. List of Documents: Include a table of contents for each O&M and emergency, operations listed per CSI Specification number.
 2. List of Systems and Subsystems: Include references to operation and maintenance manuals that contain information about each system.
 3. List of Equipment: List equipment for each system, organized by system. For pieces of equipment not part of system, list separately.
 4. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."
 5. This Directory shall be submitted to the University's Representative for review and acceptance.

1.07 MAINTENANCE AGREEMENTS

- A. Prior to Closeout all Maintenance Agreements required by the Contract Documents shall be assembled and submitted electronically with the Closeout Submittal Requirements.

1. Provide all Maintenance Agreements in PDF form.
 - a. Submit individual files for each Maintenance Agreement with a directory assembled by CSI division.
 - 1) Combine all project Maintenance Agreements including the directory into one PDF for record.
 - 2) Files will be formatted for printing with a footer identifying the CSI number and UC Davis Health project number.
 - 3) There will be a front cover to the file that contains all project information including the **Contractor** contact information.

1.08 EMERGENCY MANUALS

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

1.09 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 49 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 subcontractor's 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. University Recourse: Written warranties made to the 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 PDF electronically signed or signed and scanned copies of each. Organize documents into an orderly sequence based on the table of contents of the Project Manual CSI divisions.

2. Table of Contents: Provide PDF electric file with links to individual warranty sections. Include the following information.

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. Warranty Submittal

1. Provide all warranties in PDF composite electronically indexed files.

a. Submit individual files for each warranty with a directory assembled by CSI division.

1) Combine all project warranties including the directory into one PDF for record

2) Files will be formatted for printing with a footer identifying the CSI Number and UC Davis Health Project Number.

3) There will be a front cover to the file that contains the title "WARRANTY, GUARANTEE AND BOND" as well as all project information including the **Contractor** contact information. Title of Project and UC Davis Health Project Name and Number.

- 4) Coordinate copies of each warranty to be included in operation and maintenance manuals.
- 5) Final Submittal shall be incorporated into one PDF, bookmarked and searchable document.

F. Time of Submittals: Submit **[60]** calendar days 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.

1.10 AS-BUILT DOCUMENTS

A. Definitions:

1. The terms “As-Built Documents” or “As-builts” shall mean the marked-up version of the Contract Documents prepared by **Contractor** to record as-built conditions, changes, and selections made during construction.

B. Preparation of data shall be done by person(s):

1. Trained and experienced in the maintenance, preparation, and submittal of As-Built Documentation.
2. Familiar with requirements of this Section.

C. As-built Documents Content:

1. As-built Drawings and Specifications
2. As-built Schedule
3. Miscellaneous As-Built Submittals

D. As-Built Drawings and Specifications: Provide a complete set of As-Built Drawings and Specifications, showing and noting every change from the Contract Set, including but not limited to:

- Changes made in response to RFI's
- Amended Construction Documents (ACD) and related RFI's
- Change Orders/Field Orders and related RFI's.
- Architect's Supplemental Information (ASI) and related RFI's.
- Changes to locations, including access panels, windows, doors, plumbing, etc.
- Changes caused by obstructions and the obstructions notated
- Changes made in response to inspections
- Final dimensions
- Deferred Submittals (see “Miscellaneous As-Built Submittals” below)
- Shop Drawings (see “Miscellaneous As-Built Submittals” below)
- Final product selections

1. Format Requirements:

- a. Provide in PDF format with bookmarks. All annotations shall be neat and legible.
- b. File naming conventions:

- 1) Drawings: YY_MMDD_University's Project Number_As-Built_Dwgs
 - 2) Specifications: YY_MMDD_University's Project Number_As-Built_Spec
- c. Provide text (preferably 1/4" or larger) on each drawing and on the cover of the specifications indicating the submission date, the University's Project Number, and the term "As-Built". The text shall be the same size and general location on all sheets of the drawings and care should be taken to locate the text in a place as to not obscure text or linework on the drawings.
- d. Bookmarks: Provide bookmarks in the following format:
- 1) Drawings: Sheet Number – Sheet Name. Do not add additional categories or disciplines.
 - 2) Specifications: The first page of each section shall be bookmarked with: Section Number – Section Name.
 - Exception: If a hyperlinked Table of Contents is provided the bookmarks may be excluded.
- e. Supplemental sheets: When adding a supplemental sheet containing sketches or other information that describe changes to the Contract Documents:
- 1) Provide a two-digit numerical suffix that starts with .01 and ascends for every supplemental sheet:
Example: If the supplemental sheet contains sketches that describe changes to the hypothetical sheet "A1-01" the first supplemental sheet will be numbered "A1-01.01".
 - 2) The sheet name and number are to be similar in text size and location to the sheet being supplemented.
 - 3) Include supplemental sheets in bookmarks.
- E. As-Built Schedule: Provide As-Built schedule per SECTION 013200 CONTRACT SCHEDULES
1. Format Requirements:
 - a. Schedule to be in PDF format.
 - b. File naming conventions:
 - 1) YY_MMDD_University's Project Number_As-Built_Schedule
- F. As-Built Shop drawings:
1. Format Requirements:
 - a. File naming convention for shop drawings:
 - 1) YY_MMDD_University's Project Number_ShopDwg_Spec
Section Number

- G. As-built Documents Submittal: Submit all As-Built Documents together after Final Completion and in accordance with SECTION 017700 CLOSEOUT PROCEDURES. Allow 10 business days for initial review and for each resubmittal.

1.11 AS-BUILT PRODUCT DATA

EDIT NOTE: PM to verify product data is required as part of close out submittal in addition to submittals collected during construction

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 1. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 2. Format: Submit Product Data as annotated PDF electronic file Include As-Built Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.12 AS-BUILT PRODUCT SAMPLES

EDIT NOTE: PM to verify physical samples are required as part of close out submittal. PM to make storage arrangements if physical samples are to be submitted.

- A. Preparation: Mark Samples to identify the material and location or use on project; indicate finish designations of materials and products, where designations are indicated on Drawings. Cross-reference Samples with corresponding Product Data submitted.
 - 1. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 1. Note related Change Orders, As-Built Specifications, and As-Built Drawings where applicable.
 - 2. Format: Submit As-Built Samples in same size and format as indicated for each sample in the specification's sections. Pack samples securely, with protective wrapping. Include As-Built Samples directory organized by Specification Section number and title.
 - 3. Each Sample will be labeled with Manufacturer, Model, Product Number, CSI Section and UC Davis Health Project Name and Number.

1.13 PHOTOGRAPHS

- A. General: Prior to Closeout all photographic documentation required per 013220 Construction Progress Reporting shall be assembled and submitted with the Closeout Submittal Requirements.

1.14 CONSENT OF SURETY AND FINAL CERTIFICATES

- A. General: Prior to closeout Consent of Surety and Final Certificates required by the Contract Documents shall be assembled and submitted with the Closeout Submittal Requirements.

PART II - PRODUCTS – Not Applicable to this Section

PART III - EXECUTION

3.01 Refer to the following attachments

- A. Guarantee
- B. Report of Work Required by Warranty

END OF SECTION 01 78 00

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: _____

SECTION 01 82 00
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 017800 – CLOSEOUT SUBMITTALS
- B. Section 018100 – 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 thirty (30) calendar days prior to activities.
- B. Submit reports and videos within (14) calendar days after completion of demonstrations and instructions. Give time and date of each training session, and hours devoted to training with a list of persons present and the corresponding video.

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, commissioned, and put into operation.
- B. Send approved pdf version of completed operation and maintenance manual 7 calendar days prior to training.

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. Display on a video screen and demonstrate the use of bookmarks and searches to find information being sought.
- 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 01 82 00

**SECTION 02 41 13
SELECTIVE SITE DEMOLITION**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Remove paved asphalt concrete areas, concrete sidewalks, concrete ramps, utility pipes, utility appurtenances, light poles, light fixtures, bike racks, trees, and gate control arm equipment, as noted on the Drawings.

1.2 REQUIREMENTS

- A. Prior to starting demolition, comply with requirements listed in related Division 1 Sections. Comply with Environmental Protection Agency (EPA) regulations and disposal regulations.

1.3 RELATED WORK

- A. Section 01 14 00 Work Restrictions
- B. Section 01 23 00 Alternates
- C. Section 01 35 16 Alteration Project Procedures
- D. Section 01 35 43 Environmental Procedures
- E. Section 01 41 00 Regulatory Requirements
- F. Section 01 56 00 Temporary Barriers and Enclosures
- G. Section 01 71 33 Protection of Adjacent Construction
- H. Section 01 73 23 Bracing and Anchoring
- I. Section 01 73 29 Cutting and Patching
- J. Section 01 74 00 Cleaning and Waste Management

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 UTILITIES

- A. In accordance with Section 01 14 00 Work Restrictions, locate, identify, disconnect, and cap off utility services to be demolished.
- B. Maintain and protect existing utilities to remain in service before proceeding with demolition, providing bypass connections to other parts of the building.
- C. In accordance with Section 01 73 29 Cutting and Patching, where equipment or devices have been removed, and where the active side of the pipe remains, Contractor shall cap or plug all abandoned

pipng using either threaded or soldered fittings. Do not rely on the existing valves for a positive shutoff.

3.2 DEMOLITION

- A. Conduct demolition in accordance with Section 01 14 00 Work Restrictions and Section 01 35 16 Alteration Project Procedures without disrupting University's use of nearby buildings.
- B. In accordance with Section 01 56 00 Temporary Barriers and Enclosures, conduct demolition operations and remove debris to prevent injury to people and damage to adjacent buildings and site improvements.
- C. Perform Work in such a manner as to prevent damage to existing facilities to remain or to be salvaged. Hazardous Work shall not be left standing or hanging, but shall be knocked or pulled down to avoid damage or injury to employees or the public.
- D. In accordance with Section 01 56 39 Tree & Plant Protection, conduct demolition operations in such a manner as to prevent damage to existing trees and plants that are to remain.

3.3 CUTTING AND PATCHING

- A. In accordance with Section 01 73 29 Cutting and Patching.
- B. 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.

3.4 SALVAGE

- A. Items indicated to be removed and salvaged remain University's property. Remove, clean, and deliver to University's designated storage area or as directed by the University's Representative.

3.5 DISPOSAL

- A. In accordance with Section 01 74 00 Cleaning and Waste Management.
- B. Unless otherwise indicated, demolished materials become Contractor's property.
- C. Promptly remove demolished materials from University's property and legally dispose of them. Do not burn demolished materials.

3.6 HAZARDOUS MATERIALS

- A. In accordance with Section 01 35 43 Environmental Procedures.
- B. Except as otherwise specified, in the event Contractor encounters on the Project site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), lead, or other hazardous substances that have not been rendered harmless, Contractor shall immediately stop work in the area affected and report the condition to the 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 asbestos, PCB, lead, or other hazardous substances and has not been rendered harmless. The work in the affected area shall be resumed in the absence of

asbestos, PCB, lead, or other hazardous substances, or when such materials have been rendered harmless.

- C. Disclose any hazardous substance or condition exposed during the work to the University's Representative for decision or remedy.

END OF SECTION 02 41 13

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART I - GENERAL

1.01 DESCRIPTION

- A. Scope: The Work of this Section includes all material and installation of cast-in-place Concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes as shown and detailed on the Drawings and specified herein.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.03 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mix water to be withheld for later addition at Project site.
 - 2. Concrete strength shall be based on ACI 318, Chapter 5.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
- E. Welding Certificates: Copies of certificates for welding procedures and personnel.
- F. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- G. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Cementitious materials and aggregates
 - 2. Form materials and form-release agents

3. Steel reinforcement and reinforcement accessories
4. Fiber reinforcement
5. Admixtures
6. Waterstops
7. Curing materials
8. Floor and slab treatments
9. Bonding agents
10. Adhesives
11. Vapor retarders
12. Epoxy joint filler
13. Joint-filler strips
14. Repair materials

1.04 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."

- F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 01, "Specification for Structural Concrete."
 2. ACI 17, "Specifications for Tolerances for Concrete Construction and Materials."
 3. ACI 302-2R-06, "Guide to Concrete Slabs that Receive Moisture Sensitive Flooring Materials."
- G. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
1. Contractor's superintendent.
 2. Independent testing agency responsible for concrete design mixes.
 3. Ready-mix concrete producer.
 4. Concrete subcontractor.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.
1. Avoid damaging coatings on steel reinforcement.
 2. Repair damaged epoxy coatings on steel reinforcement according to ASTM D 3963/D 3963M.

PART II - PRODUCTS

2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. Chamfer Strips: Wood, metal, PVC, or rubber strips, $\frac{3}{4}$ " x $\frac{3}{4}$ ", minimum.
- G. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- H. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1" to the plane of the exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1" in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.03 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- C. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.

- D. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 755M.
- E. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

2.04 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I/II.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Moderate weathering region, but not less than 3M.
 - 2. Nominal Maximum Aggregate Size: 1-½" inches.
- C. Water: Potable and complying with ASTM C 94.
- D. Fly Ash: CBC 1903A.5, Class F

2.05 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride. Use no mixtures not included in the mix design.

2.06 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50% aluminum oxide and not less than 25% ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- B. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.
- C. Penetrating Liquid Floor Treatment – Exterior: Chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

2.07 CURING MATERIALS – EXTERIOR CONCRETE

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- D. Curing compound and areas to receive compound must be approved by University's Representative prior to placement.

- E. Curing Compounds containing Silicates are acceptable for bare or exterior concrete but not in areas to receive any type of flooring materials.

2.11 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Epoxy Joint Filler: Two-component, semirigid, 100% solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch-thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch-thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Footings and Foundation Walls: Proportion normal-weight concrete mix Compressive Strength (28 Days): 3000 psi.
 - 1. Maximum Slump: 5" (125 mm).
- D. Slab-on-Grade: Proportion normal-weight concrete mix Compressive Strength (28 Days): 4000 psi (20.7 MPa).
 - 1. Maximum Slump: 4" (125 mm).
- E. Suspended Slabs: Proportion normal-weight concrete mix Compressive Strength (28 Days): 3000 psi (20.7 MPa).
 - 1. Maximum Slump: 4" (125 mm).

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90°F, reduce mixing and delivery time from 1-½ hours to 75 minutes; when air temperature is above 90°F, reduce mixing and delivery time to 60 minutes.

PART III - EXECUTION

3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, ⅛".
 - 2. Class B, ¼".
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
- F. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.
 - 2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. 28-day design compressive strength.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by University's Representative.

3.04 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M), ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 STEEL REINFORCEMENT

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

3.06 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by University's Representative.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2" into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Discontinue reinforcing steel at contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8". Repeat grooving of contraction

- joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8"-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2" or more than 1" below finished concrete surface where joint sealants are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.07 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by University's Representative.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24" and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of

reinforcement and other embedded items without causing mix constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90°F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.08 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding $\frac{1}{8}$ " in height.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 2. Do not apply rubbed finish to smooth-formed finish.

- C. Rubbed Finish: Apply the following to smooth-formed finished concrete:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.09 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.
 - 1. Apply scratch finish to surfaces indicated on drawings and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 - 2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 45; and levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and levelness, F(L) 24.
- E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

- F. Broom Finish: Apply a medium broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with University's Representative before application.
- G. Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 - 2. After broadcasting and tamping, apply float finish.
 - 3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

3.10 MISCELLANEOUS CONCRETE ITEMS

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

3.11 CONCRETE PROTECTION AND CURING – EXTERIOR

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12" lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12" and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least two (2) months. Do not fill joints until construction traffic has permanently ceased.

- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi rigid epoxy joint filler full depth in saw-cut joints and at least 2" deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by University's Representative. Remove and replace concrete that cannot be repaired and patched to University's Representative's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2" in any dimension in solid concrete but not less than 1" in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by University's Representative.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer

according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

- E. Perform structural repairs of concrete, subject to University's Representative's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to University's Representative's approval.

3.17 FIELD QUALITY CONTROL

- A. University's Testing Agency: University will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Samples for strength test of each class of concrete placed each day; or not less than once for each 50 cubic yards of concrete; or not less than once for each 2,000 square feet of surface area for slabs or walls. Additional samples for seven day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 4. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
 - 5. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
 - a. Test two field-cured specimens at 7 days and two at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive

strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

- D. Test results shall be reported in writing to University's Representative, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by University's Representative but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by University's Representative. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by University's Representative.

END OF SECTION 03 30 00

SECTION 05 50 00
MISCELLANEOUS METAL FABRICATIONS

PART I - GENERAL

1.01 DESCRIPTION:

- A. Scope: Work under this Section shall include all material and installation necessary to provide Miscellaneous Metal Fabrications, as shown and detailed on the drawing and specified herein.

1.02 QUALITY ASSURANCE

A. References:

1. 2022 California Building Code (CBC)
2. American Institute for Steel Construction (AISC): Steel Construction Manual, 16th Edition.
3. American Welding Society (AWS): D1.1 Structural Welding Code
4. National Association of Architectural Metal Manufacturers (NAAMM): Standards
5. Steel Structures Painting Council (SSPC): Painting Manual

B. QUALIFICATIONS:

1. General: Fabricator and installer specializing in the work of this Section with minimum three (3) years documented experience.
2. Welding: Performed by certified welders per AWS

1.03 SUBMITTALS

- A. General: Refer to Section 01 33 00 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Shop Drawings: Submit manufacture and installation details, including fastenings.
- C. Product Data: None required for specified products; required for alternate products.
- D. VOC compliance certificate signed by manufacturers certifying compliance of their products with regulations of authorities having jurisdiction over volatile organic compounds (VOCs).

1.04 PRODUCT HANDLING

- A. General: Refer to Section 01 31 00 – COORDINATION
- B. Items Requiring Anchorage in Concrete: Deliver with complete setting diagrams, measurements, ICC evaluation reports, and manufacturer's written instructions.

1.05 GUARANTEE

- A. General: Refer to Section 01 77 00 – CLOSEOUT PROCEDURES.
- B. Period: Provide in required form for a period of one (1) year from the date of final acceptance by the University's Representative.

PART II - PRODUCTS

2.01 MATERIALS

- A. Steel Shapes:
 - 1. General: ASTM A36 except ASTM A992 for wide-flange shapes
 - 2. Steel Tubing: ASTM A500, Grade B
 - 3. Steel Pipe: ASTM A53, Grade B
- B. Fastenings:
 - 1. General: Bolts, nuts, screws, washers, and other various fastenings necessary for proper erection of work. Galvanized steel fastenings or other non-rusting types for exterior steel work.
 - 2. Exposed in Finished Surfaces: Tamperproof countersunk Phillips flat head screws, unless otherwise shown; finish to match adjacent surfaces.
 - 3. Plastic Screw Anchors:
 - a. Type HUD, manufactured by Hilti, Inc.
 - b. Star Anchors and Specialty Fasteners, Inc., or equal.
- C. Post-installed Anchors:
 - 1. Except where indicated on the drawings, post-installed anchors shall consist of the following anchor types as provided by Hilti, Inc. or approved equal.
 - a. Anchorage to concrete
 - i) Adhesive anchors for cracked/uncracked concrete use:
 - 1) Hilti HIT-HY 200 Safe Set System with HILTI HIT-Z rod per ICC ESR-3187
 - 2) Hilti HIT-HY 200 Safe Set System with HILTI Hollow Drill Bit System with threaded rod per ICC ESR-3187.
 - 3) Hilti HIT-RE 500-SD Epoxy Adhesive Anchoring System with threaded rod per ICC ESR-2322 for slow cure applications
 - 4) ITW Red Head EPCON G5 per ICC-ESR 1137
 - 5) Powers PE 1000 per ICC-ESR 2583

- ii) Medium duty mechanical anchors for cracked/uncracked concrete
 - 1) Hilti KWIK HUS EZ and KWIK HUS EZ-I screw anchors per ICC ESR-3027
 - 2) Hilti KWIK BOLT-TZ expansion anchors per ICC ESR-1917
 - 3) ITW Red Head PER ICC-ESR 2427
 - 4) Powers Power-Stud SD2 per ICC-ESR 2502
 - 5) Hilti KB-TZ2 expansion anchors per ICC ESR-4266
- iii) Heavy duty mechanical anchors for cracked concrete use
 - 1) Hilti HDA undercut anchors per ICC ESR 1546
 - 2) Hilti HSL-3 expansion anchors per ICC ESR 1545
 - 3) USP DUC undercut anchors per ICC ESR 1970
- b) Rebar doweling into concrete
 - i) Adhesive anchors for cracked concrete use
 - 1) Hilti HIT-HY 200 Safe Set System with Hilti Hollow Drill Bit System with continuously deformed rebar per ICC ESR-3187.
 - 2) Hilti HIT-RE 500-SD Epoxy Adhesive Anchoring System with continuously deformed rebar per ICC ESR-2322.
 - 3) ITW Red Head EPCON G5 per ICC-ESR 1137
 - 4) Powers PE 1000 per ICC-ESR 2583
 - c) Anchorage to solid grouted masonry
 - i) Adhesive anchors use
 - 1) Hilti HIT-HY 70 Masonry Adhesive Anchoring System per ICC-ESR 3342
 - 2) Steel anchor element shall be Hilti HAS-E continuously threaded rod or continuously deformed steel rebar
 - 3) Simpson Acrylic Tie Adhesive Anchor System per ICC-ESR 1958
 - 4) Powers T 38+ Epoxy per ICC-ESR 3149
 - ii) Mechanical anchors use
 - 1) Hilti KWIK BOLT-3 Expansion Anchors per ICC ESR 1385
 - 2) Hilti KWIK-HUS EZ Screw Anchors per ICC-ESR 3056
 - 3) Simpson Titen Screw Anchors per ICC-ESR 1056
 - 4) Powers Wedge Bolt per ICC-ESR 1678
 - d) Anchorage to hollow/multi-wythe masonry
 - i) Adhesive anchors use
 - 1) Hilti HIT-HY 70 Masonry Adhesive Anchoring System per ICC ESR-3342.
 - 2) Steel anchor element shall be Hilti HAS-E continuously threaded rod or continuously deformed steel rebar.
 - 3) The appropriate size screen tube shall be used per adhesive manufacturer's recommendation.
 - 4) Simpson Acrylic Tie Adhesive Anchor per ICC-ESR 1958

- 2) Anchor capacity used in design shall be based on the technical data published by the manufacturer or such other method as approved by the Structural Engineer of Record. Substitution requests for alternate products must be approved in writing by the Structural Engineer of Record prior to use. Contractor shall provide calculations demonstrating that the substituted product is capable of achieving the performance values of the specified product. Substitutions will be evaluated by their having an ICC ESR showing compliance with the relevant building code for seismic uses, load resistance, installation category, and availability of comprehensive installation instructions. Adhesive anchor evaluation will also consider creep, in-service temperature and installation temperature.
- 3) Install anchors per the manufacturer instructions, as included in the anchor packaging.
- 4) Overhead adhesive anchors must follow manufacturer's printed installation procedures.
- 5) The contractor shall arrange an anchor manufacturer's representative to provide onsite installation training for all of their anchoring products specified. The Structural Engineer of Record must receive documented confirmation that all of the contractor's personnel who install anchors are trained prior to the commencement of installing anchors.
- 6) Anchor capacity is dependent upon spacing between adjacent anchors and proximity of anchors to edge of concrete. Install anchors in accordance with spacing and edge clearances indicated on the drawings.
- 7) Existing reinforcing bars in the concrete structure may conflict with specific anchor locations. Unless noted on the drawings that the bars can be cut, the contractor shall review the existing structural drawings and shall undertake to locate the position of the reinforcing bars at the locations of the concrete anchors, by Hilti Ferroscan, GPR, X-Ray, chipping or other means.

D. Non-Shrink Grout:

1. "Embco" manufactured by BASF Corporation
2. W.R. Meadows, Inc, or equal.

E. Primer: Per Section 09 90 00 – PAINT AND COATING

2.02 FABRICATION

A. Workmanship:

1. General: Shop assemble work in largest practical sections; minimize field connections. Grind smooth parts exposed to view; remove weld marks and leave free of fabrication marks. Miter corners and edges unless otherwise shown. Make members true to length so assembling may be done without fillers. Bends, twists, open joints in finished members, or projecting edges or corners at connections will not be permitted. Miter, cope, and block carefully to produce tight hairline joints. Provide lugs, clips, connections, bolts, and fastenings necessary to complete fabrication.

2. Galvanizing: Treat all areas burned off or damaged during fabrication with specified repair compound.
3. Reinforcement: Provide proper reinforcement for hardware, and other fabricated metal work, as required.
4. Welding: Use sequence welding to minimize distortion and heat stresses. Weld by shielded electric arc process per AWS. Use continuous welding along entire area of contact, except where spot welding is permitted. Grind all welds smooth on exposed surfaces. Spot welding not permitted on exposed surfaces.
5. Shop Painting: Per SSPC standards.

PART III - EXECUTION

3.01 PREPARATION

- A. General: Refer to Section 01 31 00 – COORDINATION
- B. Conditions of Work in Place: Carefully examine before beginning work; report defects.
- C. Job Measurements: Take field measurements; report discrepancies between plan and field dimensions.

3.02 INSTALLATION

A. Performance:

1. General: Install with workmen skilled in the particular type of work required and in accordance with the written instructions of the manufacturers.
2. Coordination: Deliver miscellaneous metal items to be installed in concrete or masonry, complete with all clips, anchors or bolts necessary to secure them in place.
3. Workmanship: Set work plumb and true; properly assemble and erect in a rigid and workmanlike manner. Do cutting, punching, drilling and tapping for attachment of other work coming into contact with fabricated metal work where indicated or as directed. Do necessary cutting, drilling, and fitting for installation of fabricated metal work. Execute drilling, cutting, and fitting carefully; when required, fit work at job before finishing. No burning in field permitted. Replace, or repair parts damaged or injured during erection in an acceptable manner. Drill holes for fasteners to exact diameter as recommended by fastener manufacturer. Oversized holes or holes not properly located that produce misalignment of fastener will be rejected.
4. Field Touch-up: Touch-up damaged surfaces and field welds of steel, scheduled to be painted, per SSPC standards.
5. Protection: After erection, provide proper protection for fabricated metal items from other construction operations.

B. Non-shrink grout:

1. Convene pre-application meeting two (2) weeks before start of application of non-shrink grout.
2. Require attendance of parties directly affecting work of this section, including contractor, architect, engineer, applicator, and manufacturer's representative.
3. Review materials, surface preparation, forming, mixing, placing, curing, protection, and coordination with other work.

END OF SECTION 05 50 00

**SECTION 05 52 00
METAL RAILINGS**

PART I - GENERAL

1.01 DESCRIPTION

- A. Scope: Work of this Section shall include all materials and installation necessary to provide pipe and tube railings as shown and detailed on the Drawings and specified herein.
- B. This Section includes the following:
 - 1. Steel pipe and tube handrails and railings.

1.02 QUALITY ASSURANCE

- A. References:
 - 1. 2022 California Building Code (CBC)
 - 2. American Welding Society (AWS): D1.1 Structural Welding Code-Steel
 - 3. National Association of Architectural Metal Manufacturers (NAAMM): Standards
 - 4. Steel Structures Painting Council (SSPC): Painting Manual

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected handrails and railings.
 - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.
- C. Structural Calculations: Prepared by Civil or Structural Engineer licensed to practice in the State of California for the railing system and anchor point attachment to walls and floor.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for products with factory-applied color finishes.
- E. Samples for Initial Selection: Short sections of railing or flat, sheet metal samples showing available mechanical finishes.
- F. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. ±6" (150-mm) long sections of each distinctly different linear railing member,

including handrails, top rails, posts, and balusters.

2. Fittings and brackets.
3. Assembled sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Sample need not be full height.

1.04 STORAGE

- A. Store handrails and railings in a dry, well-ventilated, weather tight place.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.06 COORDINATION

- A. Coordinate installation of anchorages for handrails and railings. 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.

1.07 SCHEDULING

- A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

PART II - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements.
 1. Steel Pipe and Tube Railings:
 - a. Humane Equipment Co.
 - b. Wagner: R & B Wagner, Inc.
 - c. Or equal.

2.02 METALS

- A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
- B. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
 1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

- a. Black finish, unless otherwise indicated.
 - b. Galvanized finish for exterior installations and where indicated.
 - c. Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.
2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 4. Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).
- C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.03 WELDING MATERIALS, FASTENERS, AND ANCHORS

- A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless otherwise indicated.
 2. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for handrails and railings indicated.
 3. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
1. Cast-in-place anchors.
 2. Expansion anchors.

2.04 PAINT

- A. Shop Primers: Provide primers to comply with applicable requirements in Division 9 Section "Painting."

2.05 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.06 FABRICATION

- A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- E. Nonwelded Connections: Fabricate handrails and railings by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

- G. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- H. For railing posts set in concrete, provide preset sleeves of steel not less than 6" (150 mm) long with inside dimensions not less than 1/2" (12 mm) greater than outside dimensions of post, and steel plate forming bottom closure.
- I. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- J. Ease exposed edges to a radius of approximately 1/32" (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- K. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- L. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
- M. Fabricate joints that will be exposed to weather in a watertight manner.
- N. Close exposed ends of handrail and railing members with prefabricated end fittings.
- O. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4" (6 mm) or less.
- P. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Provide any exposed fasteners with finish matching appearance, including color and texture, of handrails and railings.

2.08 STEEL FINISHES

- A. Galvanized Handrails and Railings: Hot-dip galvanize exterior steel and iron handrails and railings to comply with ASTM A 123. Hot-dip galvanize hardware for exterior steel and iron handrails and railings to comply with ASTM A 153/A 153M.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- C. 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.
- D. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- E. Preparation for Shop Priming: After galvanizing, thoroughly clean handrails and railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.
- F. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Stripe paint edges, corners, crevices, bolts, and welds.

PART III - EXECUTION

3.01 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of $1/16$ " in 3' (2 mm in 1 m).
 3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed $1/4$ " in 12' (5 mm in 3 m).
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- D. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2" (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6" (150 mm) of post.

3.04 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:
- B. Cover anchorage joint with flange of same metal as post, attached to post as follows:
 - 1. By set screws.
- C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum pipe railings, attach posts as indicated using fittings designed and engineered for this purpose.
- D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.05 ANCHORING RAILING ENDS

- A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with postinstalled anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.
 - 1. Connect flanges to railing ends using nonwelded connections.

3.06 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and

abraded areas of shop paint, and paint exposed areas with same material.

- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.07 PROTECTION

- A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 52 00

**SECTION 07 92 00
JOINT SEALANTS**

PART I - GENERAL

1.01 DESCRIPTION:

- A. Scope: Work of this Section shall include all materials and installation necessary to provide Caulking and Sealants, as shown and detailed on the drawings and specified herein.

1.02 QUALITY ASSURANCE

A. References:

- 1. Sealant, Waterproofing and Restoration Institute (SWRI): Sealant and Caulking Guide Specification.

B. QUALIFICATIONS:

- 1. General: The manufacturer of the sealant used shall have been in the business of manufacturing the specified types of such sealants for not less than ten (10) years.
- 2. Applicator: Installer specializing in the work of this Section with minimum five (5) years documented experience
- 3. Volatile Organic Compounds (VOC): Use only products in compliance with VOC content limits required by Federal and State EPA regulations.
- 4. Comply with current CAL Green Chapter-4 requirements.

- C. Compatibility With Substrate: Verify that caulking and sealants used are compatible with joint materials.

- D. Joint Tolerances: Comply with manufacturer's joint width/depth ratio limitations.

1.03 SUBMITTALS

- A. General: Refer to Section 01 33 00 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

- B. Samples: Submit manufacturer's standard colors prior to application.

- C. Product Data: Submit manufacturer's specifications, data, and installation instructions for review prior to purchase or application.

- D. Certificates: Submit certification that sealants proposed for use, comply with the Contract Documents.

1.04 PRODUCT HANDLING

- A. General: Refer to Section 01 31 00 – COORDINATION.

- B. Storage: Per manufacturer's recommendations for proper precautions for shelf life, temperature, humidity and similar storage factors to ensure the fitness of the material when installed.

1.05 SITE CONDITIONS

- A. Environmental Requirements: Do not apply materials when temperature is below 40°F, nor under extreme temperature conditions when joint openings are at maximum or minimum width.

1.06 MAINTENANCE

- A. General: Refer to Section 01 77 00 – CLOSEOUT PROCEDURES.
- B. Guarantee: On form provided at end of Section 01 78 00 – CLOSE OUT SUBMITTALS, provide five (5) year written guarantee commencing from date of final acceptance by University's Representative.

PART II - PRODUCTS

2.01 MATERIALS

- A. Caulking And Sealants:
 - 1. Manufactured by Tremco, Inc., unless otherwise noted.
 - 2. Pecora Chemical Corp. or equal.
 - 3. Color to be selected by University's Representative.
- B. Fire and Smoke Protection
 - 1. Systems and products shall be tested and approved by Underwriter's Laboratories in accordance with applicable codes. Fire-stopping and smoke-stopping materials are subject to approval of the UC Davis Health's Fire Marshal and shall carry a UL Listing.
- C. Exterior Joints:
 - 1. Vertical Surfaces: Non-sag polyurethane; by Dymeric or equal.
 - 2. Precompressed Expanding Sealant Tape:
 - a. PC-SA manufactured by Emseal Joint Systems, Ltd.
 - b. Pecora Chemical Corp. or equal.
 - 3. Horizontal Paving Joints: Self-leveling polyurethane; THC 900; interior and exterior.
- D. Interior Joints: Acrylic Latex.
- E. Joint Cleaner: Provide cleaner recommended by sealant manufacturer for specific joint surface and condition.

- F. Joint Primer and Sealer: As recommended by sealant manufacturer for each condition.
- G. Bond Breaker Tape: Pressure sensitive polyethylene tape.
- H. Other Materials: Manufacturer's standard for items required or type best suited for intended use.

PART III - EXECUTION

3.01 PREPARATION

- A. General: Refer to Section 013100 – COORDINATION.
- B. Conditions Of Work In Place:
 - 1. General: Carefully examine before beginning work; report defects.
 - 2. Substrate: Inspect surfaces to insure that no bond-breaker materials contaminate the surface to which the sealant is to adhere and to ensure that unsound substrates are repaired.
- C. Preparation Of Surfaces:
 - 1. Surfaces: Prepare joints in accordance with manufacturer's recommended instruction to ensure maximum adhesion. Prime as required, protecting adjacent exposed surfaces.
 - 2. Sealants: Prepare sealant as required, including proper mixing of multicomponent sealants.

3.02 APPLICATION

- A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
- B. Protection: Protect surfaces adjacent to joints to receive sealant. Cover joints in walking surfaces with heavy duty, non-staining tape, until material has dried.
- C. Installation:
 - 1. General: Install sealant materials per manufacturer's instructions. Prevent three-sided adhesion. Provide sealant depth of $\frac{1}{2}$ joint width; minimum depth of $\frac{1}{4}$ "; maximum of $\frac{1}{2}$ ", unless otherwise required by the manufacturer.
 - 2. Horizontal joints shall be made watertight by mechanical connections. Sealant shall be used on vertical joints.
 - 3. Limit width to depth ratio of 2:1 with maximum hourglass depth of 0.375 inch and provide sealant backer. Sealants shall be compatible with the materials and the expected movement where they are being applied.
 - 4. Backer Rod: Install using blunt or rounded tools to insure uniform ($\pm\frac{1}{8}$ ") depth without puncturing material. Use oversize backer rod; minimum of 33% for closed cell type; minimum of 50% for open cell type, unless otherwise required by the manufacturer.

3.03 CLEANING

- A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instructions. Perform cleaning in a manner that will not affect the appearance of the sealant or the adjacent finish material.

END OF SECTION 07 92 00

**SECTION 08 11 00
METAL DOORS AND FRAMES**

PART I - GENERAL

1.01 DESCRIPTION

- A. Scope: Work under this Section shall include all material and installation necessary to provide Hollow Metal Doors and Frames, as shown and detailed on the Drawings and specified herein.

1.02 QUALITY ASSURANCE

- A. Labeled Doors And Frames: Conform to requirements of State Fire Marshal Standard 12-43-4 and Underwriters Laboratory. Provide label information required by Section 12-43-407, Part 12, T-24 CCR.
- B. Design Requirements: Exterior glazed frame members designed to withstand a wind load of 24 lbs. per square foot, minimum.
- C. Reference Standards:
 - 1. Handicapped Requirements:
 - a. General: Comply with requirements of the Americans with Disabilities Act.
 - b. American National Standards Institute (ANSI): ANSI A117.1: Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
 - 2. Steel Door Institute (SDI): ANSI/SDI A250.6 typical.
 - 3. Door Hardware Institute (DHI): Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
 - 4. National Fire Protection Association (NFPA):
 - a. NFPA 80: Fire Doors and Windows.
 - b. NFPA 252: Fire Tests for Door Assemblies.
 - 5. Underwriters Laboratories (UL): UL 10B, Fire Tests for Door Assemblies.

1.03 SUBMITTALS

- A. Shop Drawings: Submit manufacture and installation details, including fastenings, for review. Show details of each condition at 3" scale.
- B. Samples: If specifically requested.
- C. Product Data: Submit manufacturer's specification, data, and installation instructions for review.

PART II - PRODUCTS

2.01 MATERIALS

- A. Steel:
 - 1. Sheet: ASTM A366 (CR) and A569 (HR), uncoated, pickled, and free from pits and defects. Use cold-rolled or hot-rolled for frames; stretcher-leveled for 18 gauge and lighter.
 - 2. Reinforcement: ASTM A36.
- B. Fasteners: Galvanized or cadmium plated.
 - 1. Bolts and Nuts: ASTM A307, Grade A.
 - 2. Machine Screws: FS FF-S-92, Type III cross-recessed, Design I or II recess, Style 2c flat head; carbon steel.
 - 3. Sound Deadening: Fibered asphalt emulsion.
- C. Silencers: Resilient rubber; manufacturer's standard.
- D. Sealant: Refer to Division 7, Section 07 92 00 – Caulking and Sealants.

2.02 MANUFACTURE

- A. Hardware Requirements: Prepare doors and frames at factory to receive template hardware per final schedule; locate as specified under Division 8, Section 08710 – Finish Hardware. Provide reinforcements of specified thicknesses and sizes recommended by hardware manufacturer; hinge reinforcements not less than 7 gauge and at least 9" long; other mortised and countersunk items not less than 12 gauge; surface applied items not less than 14 gauge.
- B. Hollow Metal Doors:
 - 1. General:
 - a. Exterior (Thermally Broken): SDI-100 Grade II, Model 2.
 - 2. Door Construction:
 - a. Face: Steel sheet in accordance with ANSI/SDI-100.
 - b. Core:
 - 1) General: Manufacturer's standard for following uses.
 - 2) Composite: For Fire rating, as shown.
 - 3) Thermal Insulated: Total insulation R value of 11, measured in accordance with ASTM C236.
 - 4) Sound Rated: STC of 50, measured in accordance with ASTM E413.

3. Accessories:
 - a. Vision Light Frames: Model No. BFL-75; glass and glazing per Division 8 "Glass and Glazing" as shown.
 - b. Fasteners: Manufacturer's standard; tamperproof.
4. Astragals: $\frac{1}{8}$ " x 2" steel, as shown, specifically for double doors. Secure with tamperproof bolts at 6" on center and 1" from each end.

C. Metal Frames:

1. Exterior: 14 gauge.

D. Finish: Baked primer Factory baked enamel; color as selected by the University's Representative.

2.03 FABRICATION

A. Metal Doors:

1. Types:
 - a. Flush Doors: Fabricate doors with hardware reinforcement welded in place. Close top and bottom edge of exterior doors with flush end closure. Seal joints watertight.
2. Glazed Openings: As shown.
3. Door Clearances: Provide $\frac{1}{8}$ " maximum clearance at jambs, heads, and meeting stiles; threshold clearances as specified under Division 8 "Finish Hardware".
4. Electrical Requirements: Make provisions for installation of electrical items specified in Division 8 "Finish Hardware" and other applicable Sections.

B. Metal Frames:

1. Type:
 - a. Standard Frames: Fabricate frames as welded unit.
2. Reinforcement:
 - a. General: Reinforce frames wider than 48" with roll-formed steel channels fitted tightly into frame head, flush with top.
 - b. Hardware: Fabricate frames with reinforcing plates welded in place. Provide mortar guard boxes, where required.
3. Stops:
 - a. Applied Stops: Rolled steel shape, mitered corners, prepared for countersink style tamper proof screws. Provide replaceable closed-cell sponge neoprene gasket, thickness as recommended by manufacturer.

- b. Hospital Type: Terminate doorstops 6" above finished floor. Cut stop at 45° angle and close.
 - 4. Mullions for Double Doors: Fixed type, of same profiles as jambs.
 - 5. Silencers:
 - a. Single Doors and Mullions of Double Doors: Provide three (3) single silencers equally spaced on strike side.
 - b. Frame Head at Double Doors without Mullions: Provide two (2) single silencers equally spaced.
 - 6. Sound Deadening: Coat inside (concealed) faces of doorframes in hollow wall construction. Apply emulsion over shop primer 1/8" thick and dry thoroughly before handling.
- C. Anchors:
- 1. General: Fabricate 16 gauge x 2" wide anchors of same material used for door frames.
 - 2. Metal Stud Partitions: Metal stud type anchors.

PART III - EXECUTION

3.01 PREPARATION

- A. General: Refer to Division 1, Section 01 31 00 – Coordination. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

- A. General: Install in strict conformance with referenced standards, the manufacturer's written directions, as shown, and as herein specified.
- B. Anchors:
 - 1. Jambs:
 - a. General: Position one (1) anchor above top butt reinforcement and one (1) anchor below bottom butt reinforcement; minimum four (4) anchors per doorjamb, 24" on center maximum.
 - b. Frames Set in Metal Stud Partitions:
 - 1) General: Weld to frames and studs.
 - 2) 16 gauge Studs: Fasten to studs with sheet metal screws per anchor manufacturer's recommendations.
 - 2. Head: Provide minimum of two (2) anchors at frames over 2'-6" wide; 24" on center, maximum.
- C. Metal Frames:

1. General: Set frames plumb, straight and square; align and securely brace until permanent anchors are set; use shims where required. Remove temporary braces after wall construction is completed.
2. Door Frames:
 - a. Standard Frames: Where shown, provide overhead frame bracing; securely anchor to structure. Install roll-formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.
3. Sealant: Seal perimeter of frames and adjoining material per Division 7, Section 07 92 00 – Caulking and Sealants.

D. Metal Doors:

1. General: Match doors into their respective frames; install plumb, straight and square.
2. Glazed Lights: Coordinate installation of glazing per Division 8, Section 08 80 00 – Glass and Glazing.
3. Hardware: Per Division 8, Section 08 70 00 – Finish Hardware.
4. Maximum Diagonal Distortion: $\frac{1}{8}$ " measured with straight-edge, corner to corner.

E. Finish: Touch-up factory applied finish.

3.03 ADJUSTMENTS

- A. General: Prior to acceptance, adjust moveable parts to assure smooth operation.

3.04 CLEANING

- A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instructions.

END OF SECTION 08 10 00

**SECTION 08 70 00
DOOR HARDWARE**

PART I - GENERAL

1.01 DESCRIPTION

- A. Scope: Work under this Section shall include all materials and installation necessary to provide Finish Hardware as shown and detailed on the Drawings and specified herein.

1.02 QUALITY ASSURANCE

A. References:

1. General: Satisfy current applicable fire, building and accessibility codes and rules.
2. Accessibility Standards:
 - a. General: ANSI A117.1 and the California Building Code section 11-B
 - b. Americans with Disabilities Act (ADA): Standards
3. National Fire Protection Association (NFPA): NFPA 80, 101, and 252
4. American Woodwork Institute (AWI): Quality Standards
5. Underwriters Laboratories: UL 10B and 305

1.03 QUALIFICATIONS:

A. Supplier:

1. General: A firm specializing in the supply and servicing of institutional and commercial door hardware for at least five (5) years.

1.04 SUBMITTALS

A. Hardware Schedule:

1. General: Submit completely detailed finish hardware schedule in vertical format. Reference headings to hardware groups specified and clearly indicate door type, or mark, describe its location, hand, size, door and frame material, and fire rating, if applicable. Organize all doors with the exact same hardware group under one heading, either per building, or per project. If per project, list doors per building in numerical order.
2. Non-Acceptance: Coded, or keyed hardware scheduling, creating a separate heading for every door and requiring reference to master lists of products is not acceptable, and will be rejected without review.

B. Manufacturers List:

1. General: List manufacturer's names and product numbers for items used in hardware schedule to facilitate checking for compliance.
2. Product Source: Furnish each type of lock and latchset from a single manufacturer, unless more than one manufacturer's products are specified
3. Substitutions: Refer to Division 1, Section 01 61 00 – Product Requirements. If substitutions are offered, list both the specified product and the proposed substitution.
 - a. Samples:
 - 1) General: Submit, with hardware schedule, physical sample of each item proposed to be substituted for specified item.
 - 2) Label: Clearly mark each sample to indicate name of item, brand name, manufacturer's catalog number and item for which it is proposed to be substituted.
 - 3) Disposition: Approved samples may be used in work; rejected samples will be returned.

1.05 PRODUCT HANDLING

- A. General: Refer to Division 1, Section 01 31 00 – Coordination.
- B. Packaging: Mark all materials so as to identify door number, hardware type, location and hand of door
- C. Keys: Label and deliver all keys to University's Representative.
- D. Coordination:
 1. General: Hardware applied to aluminum or metal doors and frames and factory prepared wood doors and frames shall be made to template; provide two copies of approved finish hardware schedule for use by door and frame suppliers.
 2. Distribution: Furnish two copies of each template to those manufacturers who are not listed as current registered template book holders; furnish two copies of each template for items whose manufacturers do not provide registered template book.

1.06 MAINTENANCE

- A. Guarantee:
 1. General: Provide in required form for a period of one (1) year from date of final acceptance by University.
 2. Door Closers: Twenty-five (25) years.
 3. Exit Devices: Five (5) years.

PART II - PRODUCTS

2.01 MATERIALS

- A. SPECIFIED PRODUCTS AND ACCEPTABLE MANUFACTURERS Catalog numbers used below are those of the following specified manufacturers. Acceptable alternate manufacturers are as listed; items produced by acceptable manufacturers, comparable to those specified in material, weight, size, function, design and finish will be considered accepted equals to those items specified and will not require submittal of physical sample or request for substitution. Any other manufacturers other than those listed as "Specified" or "Acceptable Manufacturer" will be considered as "or equal" subject to requirements for substitution requests or required by Division 1. University's Representative's decision regarding any item submitted for approval as equal to that specified shall be final.

Product	Specified	Acceptable Manufacturers
Hinges	Hagar	Stanley; Ives
Special control hinges	Rockford Process	No known equal
Interior Doors (Locks & Cylinders)	Schlage "ND" series	No known equal
Exterior Doors (Locks & Cylinders)	Schlage Primus L series	No known equal
Closers	LCN 4040	Dorma; Yale
Floor/Wall Stops	Glynn Johnson	Brass; Quality
Exit Devices	Von Duprin	No known equal
Astragals	Pemco	National Guard; Zero
Thresholds and Weatherstrip	Pemco	National Guard; Zero
Silencers	Brass	Quality; Signature
Trim	Signature Brass	Door Controls Int'1; Quality
Overhead Stops and Holders	Glynn-Johnson	Rixon; Sargent
Flush Bolt Coordinators	Ives	No known equal
Electronic Strikes	Von Duprin 6100/6300 series	No known equal
Electronic Locksets	Schlage L9080 series/ND 96 series	No known equal
Electromagnet Holders	LCN	Rixon
Electromagnet Locks	SDE	Locknetics
Bifold Hardware	Grant	Haefele; L.E. Johnson
Key Cabinet	Door Controls Intl.	H.B.Ives; Telkee; Lund; Key Control Systems, Inc.

Key Cabinet:

- B. Manufactured Units:

1. Locks:
 - a. General: Provide wrought boxes for strikes.
 - b. Keys: Furnish three (3) uncut blanks for each lockset, in keyways to match project system.
2. Closers: Key valve type or screw type; furnish one key for each five (5) closers. Fasten with four (4) sex bolts per closer. Provide 180° opening where indicated. Provide parallel arms with jamb attachment for all out-swinging doors. Supply drop plates at narrow top rail doors, as required.

3. Screws, Bolts, and Fastening Devices: Exposed head oval Phillips type in countersunk holes, unless otherwise specified or required. Use screws, bolts, washers, grommets, nuts, and other fastening devices of appropriate length, type, head, metal and finish, as necessary for proper match and application of hardware. See Division 5, Section 05 50 00 – Metal Fabrications.
4. Fire Rated Doors: Equip fire rated doors with UL listed hardware meeting requirements of CBC Chapter 43 and Fire Protection Equipment list of Underwriters Laboratories, Inc.
5. Padlock: Schlage PL4741 padlock or equal keyed as directed for roof hatches, gates, traffic barrier bollards and roof access ladder security covers.
6. Thresholds: Provide all thresholds, door bottoms and seals as specified, or detailed. Provide thresholds with non-standard custom-drilled screw holes where details indicate this requirement.
7. Butt Hinges:
 - a. General Locking reverse bevel doors shall be furnished with NRP feature butts. All doors with closers shall be furnished with ball, or oilite bearing butts.
 - b. Exterior: Butts for reverse bevel exterior doors shall be of equivalent model listed, but shall be of nonferrous metal.
 - c. Size: Unless otherwise specified, the size of the butts will be determined by the following rules:
 - 1) Doors 1- $\frac{3}{8}$ " thick and up to 2'-4" wide: 3- $\frac{1}{2}$ " butts.
 - 2) Doors 1- $\frac{3}{8}$ " inch thick over 2'-4" to 3'-0" Wide: 4" butts.
 - 3) Doors 1- $\frac{3}{4}$ " thick up to 3'-0" wide: 4- $\frac{1}{2}$ " butts.
 - 4) Doors 1- $\frac{3}{4}$ " thick over 3'-0" wide: 5" butts.
 - 5) Note: All butts shall be of proper width to clear trim in projection to allow 180° swing and that width shall be determined by the following rules:
 - 6) For doors up to 2- $\frac{1}{4}$ " thick: twice the door thickness, plus trim projection, less $\frac{1}{2}$ ", equals the proper hinge width. For doors 2- $\frac{1}{4}$ " to 3" thick: twice the door thickness, plus trim projection, less $\frac{3}{4}$ " equals the proper hinge width. Furnish three butts for each door leaf up to 7'-0" high. Furnish an additional butt for each 2'-0" of door height over 7'-0".

2.02 KEYING

- A. General: All keyed locks shall have temporary cylinders or plugs during construction. Provide following:
 1. Grand Master Key System:

- a. General: Key to University's existing Primus Controlled Access Grand Master Key System; provide six (6) cut GMK and six (6) cut Master Keys per set; allow for four (4) Master Key sets.
 - b. Keying: All final keying to be performed by UCDCM Lock Shop. Deliver interior and exterior cylinders to University's Representative for final re-keying.
2. Key Control System: Visual; stamp keys with key set symbols.
 3. Construction Master Key System: Furnish twenty (20) construction master keys, and four (4) extractor keys.
 4. Change Keys: Three (3) standard bow change keys per cylinder.

2.03 FINISHES

- A. General: Provide finishes as follows, unless otherwise indicated:

Hinges:	Exterior 630 (32D);
Interior	652 (26D)
Locks:	626 (26D)
Closers:	689 (Aluminum finish)
Floor Closers:	626 (26D)
Stops:	626 (26D)
Exit Devices:	626 (26D)
Thresholds/Weatherstripping:	628 (28)
Trim:	626 (26D)
Protection Plates:	63G (32D)
Special Items:	As Noted
Key Cabinet:	Manufacturer's standard

PART III - EXECUTION

3.01 APPLICATION

- A. General: Install in strict conformance with referenced standards, the manufacturer's written directions, as shown, and as herein specified.
- B. Floor Clearances: Unless detailed otherwise on Drawings, provide following clearances:
1. Labeled Doors: $\frac{3}{8}$ " maximum over floor or threshold.
 2. No Threshold: $\frac{3}{4}$ " maximum for metal doors; $\frac{5}{8}$ " maximum for wood doors.
 3. Threshold: $\frac{1}{8}$ " typical.
 4. Carpet: $\frac{1}{8}$ " over top of nap, unless otherwise shown.
- C. Hardware Placement: Except for hinges, do not install hardware until completion of painting and finishing work. Unless detailed otherwise, place hardware at following height above finish floor:
1. Strike (Centerline) for Locks and Latches: Between 40" and 42".

2. Hinges: Manufacturer's standard.
3. Door Pull (Centerline): 42".
4. Push Plate (Centerline): 44".
5. Deadlocks (Centerline of Cylinder): 44".

D. Installation:

1. General: Install hardware in precise manner; door clearance and hardware placement as specified. Pre-drill pilot holes in wood for screws. Drill and tap for surface mounted hardware on metal.
2. Hinges: Set hinge leaves snug and flat in mortises; turn screws to flat seat (do not drive). Drive hinge pins down and tighten setscrews.
3. Closers: Mount door closers for maximum swing of door before setting stops.
4. Silencers: Set in place before adjusting strikes.
5. Locksets: Install locks with keyways in proper position, and levers, roses and escutcheons firmly affixed.
6. Thresholds: Set in waterproof sealant and secure with lead shields and countersunk screws of same finish as threshold. In heavy traffic areas use Hilti Countersunk Kwik Bolt II, size dependant on height of threshold, or equal.

E. Reinstallation Of Existing Doors:

1. General: Remove existing doors noted to have swing reversed, alter door and hardware as required, and reinstall door with new swing as indicated.
2. Hardware: Provide new hardware where existing cannot be altered to suit new conditions. New hardware, when required, of quality specified herein and function to match that of existing door.

3.02 ADJUSTMENT AND MAINTENANCE

- A. General: Prior to acceptance, adjust all moveable parts to assure smooth operation.
- B. Door Closers: Adjust for closing speed, latching speed, back checking, and adjust hold-open devices for full control of door. Maximum effort to operate doors shall not exceed 5.0 lbs. for exterior doors, 5.0 lbs. for interior doors, and 15 lbs. for fire doors.



3.03 CLEANING

- A. General: Upon completion, thoroughly clean all exposed surfaces per manufacturer's instructions.

3.04 SCHEDULES

A. Hardware Groups:

GROUP NO. 1:

1	EA	CONT. HINGE	700 TW8	630	IVE
1	EA	ELEC PANIC HARDWARE	RX-QELX-PA-AX-98-L-NL-06	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
 1	EA	SURF. AUTO OPERATOR	9542 AS REQ (120/240 VAC)	ANCLR	LCN
 1	EA	ACTUATOR, TOUCH	8310-836T	630	LCN
1	EA	ARMOR PLATE	8400 16" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
-	-	THRESHOLD	EXISTING	-	-
1	EA	POWER SUPPLY	PS914 900-2RS 120/240 VAC		VON
			CARD READER – EXISTING TO BE REUSED		

END OF SECTION 08 70 00

**SECTION 08 80 00
GLAZING**

PART I - GENERAL

1.01 DESCRIPTION

- A. Scope: Work under this Section shall include all materials and installation necessary to provide Glass and Glazing as shown and detailed on the Drawings and specified herein.

1.02 QUALITY ASSURANCE

A. References:

1. American National Standards Institute (ANSI):
 - a. ANSI/ASTM E330: Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - b. ANSI Z97.1: Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
2. Flat Glass Marketing Association (FGMA): Glazing and Sealant Manuals.
3. Laminators Safety Glass Association (LSGA): Standards Manual.
4. Sealed Insulated Glass Manufacturers Association (SIGMA): Standards.

1.03 SUBMITTALS

- A. Shop Drawings: Submit list of materials proposed for use; identify each glazing condition.
- B. Samples: Manufacturer's standard color range.
- C. Product Data: None required for specified products; required for alternate products.

1.04 PRODUCT HANDLING

- A. Delivery: Deliver with manufacturer's labels intact; do not remove until completion of final inspection.

1.05 SITE CONDITIONS

- A. Environmental Requirements: Glaze in dry conditions; minimum temperature 40°F during and 48 hours after installation of glazing compounds.
- B. Protection: Protect glass from damage until occupancy of building; replace glass damaged or broken before final acceptance.

1.06 MAINTENANCE

A. Guarantee:

1. General: Provide in required form for stated period from date of final acceptance by Owner.
2. Float Glass: Per requirements of ASTM C1036 and ASTM C1048.
3. Reflective Glass: Reflective coating; ten (10) years.
4. Transparent (Two-way) Mirrors: Reflective coating; ten (10) years.
5. Insulating Glass: Five (5) years.

PART II - PRODUCTS

2.01 MATERIALS

A. Manufacture:

1. PPG Industries, Inc. Glass Group, unless otherwise indicated, Southwall Technologies, or equal.
2. Tempered Glass and Safety Glazing: Comply with United States Consumer Product Safety Commission's "Safety Standards for Owner's Architectural Glazing Materials" (16 CFR part 1201) category I or II, as applicable; UBC Standard 54-2 and Section 5406 (c) of CBC.

B. Flat Glass:

1. General: Size and thickness as shown.
2. Tempered Glass: ASTM C1048, fully tempered with horizontal tempering.
3. Laminated Safety Glass: ¼" thick, tinted 14% light transmittance, consisting of two ⅛" inch thick lites laminated with special plastic interlayer between.

C. Glazing Materials:

1. General: Factory mixed materials recommended by glass manufacturer for each glazing condition. Provide glazing and bedding putties to match color of frame, sealants, tapes, and other materials necessary to perform glazing work. Provide setting blocks, shims, compression seals, felt and neoprene or vinyl glazing channels as required.
2. Butyl Glazing Tape:
 - a. General: 1202T as manufactured by 3M Construction Markets, the Pecora Corp., or equal.

D. Accessories:

1. General: Materials recommended by glass or glazing material manufacturer.

2. Setting Blocks and Spacers: Neoprene chemically compatible with specified sealants.
3. Glazing Points and Spring Wire Clips: Corrosion resistant.
4. Filler Rod: Compressible synthetic rubber or foam.
5. Primer-Sealers and Cleaners: As recommended by glass manufacturer.

PART III - EXECUTION

3.01 PREPARATION

- A. Surface Preparation: Clean contact surfaces with solvent and wipe dry. Seal porous glazing channels or recesses with material compatible with sealer. Prime surfaces scheduled to receive sealant.

3.02 INSTALLATION

- A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
- B. Glass:
 1. Dimensions: As shown; tolerances as recommended by manufacturer.
 2. Edges: Per referenced standards; nipped edges, or edges treated with abrasives are not acceptable.
- C. Glazing:
 1. General: Use glass as shown; glaze with glazing compound or glazing gaskets as required.
 2. Tempered Glass:
 - a. General: Type and thickness, as shown.
 3. Laminated Safety Glass: Install where shown.
 4. All individual panes of safety glazing shall have a permanent seal (mark) indicating type of glaze.

3.03 CLEANING

- A. General: Upon completion, thoroughly clean glass and frames of labels, smears, spots and other markings or defacement. Do not use alkaline or abrasive agents to clean glass.

END OF SECTION 08 80 00

**SECTION 09 90 00
PAINTING AND COATING**

PART I - GENERAL

1.01 RELATED DOCUMENTS

- A. Scope: Work under this Section shall include all materials and installation necessary to provide Painting including: exposed exterior items and surfaces, exposed interior items and surfaces, surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections as shown and detailed on the Drawings and specified herein.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and ironwork, and primed metal surfaces of mechanical and electrical equipment.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork and casework
 - b. Acoustical wall panels
 - c. Metal toilet enclosures
 - d. Metal lockers
 - e. Unit kitchens
 - f. Elevator entrance doors and frames
 - g. Elevator equipment
 - h. Finished mechanical and electrical equipment
 - i. Light fixtures
 - j. Distribution cabinets
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces

- b. Furred areas
 - c. Ceiling plenums
 - d. Utility tunnels
 - e. Pipe spaces
 - f. Duct shafts
 - g. Elevator shafts
3. Finished metal surfaces include the following:
- a. Anodized aluminum
 - b. Stainless steel
 - c. Chromium plate
 - d. Copper
 - e. Bronze and brass
4. Operating parts include moving parts of operating equipment and the following:
- a. Valve and damper operators
 - b. Linkages
 - c. Sensing devices
 - d. Motor and fan shafts
5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
- 1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
 - 2. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
 - 3. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
 - 4. Divisions 26 and 27: Painting of electrical work is specified in Divisions 26 and 27, respectively.

1.02 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 10 when measured at an 85° meter.
2. Eggshell refers to low-sheen finish with a gloss range between 10 to 15 when measured at a 60° meter.
3. Satin refers to low-sheen finish with a gloss range between 30 to 35 when measured at a 60° meter.
4. Semi-gloss refers to medium-sheen finish with a gloss range between 50 to 55 when measured at a 60° meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 75 when measured at a 60° meter.

1.03 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for each color selection verification; of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each sample. Identify the manufacturer base paint information intended for each paint color. Label each sample with same identification number, manufacturer color name/number as listed in the finish schedule.
 3. Submit Samples: 8-½" x 11" brush-outs for the Architect's review for each color and texture specified.
- C. Qualification Data: For firms and persons specified in the "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.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting

system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats unless specified otherwise.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Duplicate finish of approved prepared samples.
 - 1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft. of wall surface.
 - b. Small Areas and Items: The Architect will designate an item or area as required.
 - 2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.
 - 3. Final approval of colors will be determined by University's Representative.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material
 - 2. Product description (generic classification or binder type)
 - 3. Manufacturer's stock number and date of manufacture
 - 4. Contents by volume, for pigment and vehicle constituents
 - 5. Thinning instructions
 - 6. Application instructions
 - 7. Color name and number
 - 8. VOC content
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45°F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work

areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.06 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50° and 90°F.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45° and 95°F.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or at temperatures less than 5°F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART II - PRODUCTS

2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.
- B. Products: Provide one of the products identified in the paint schedule for the base paint. Actual paint colors may be specified from other manufacturer. Add formulated colorants as required to base paint to achieve color specified.
- C. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
 - 1. Kelly Moore Paints (KM)
 - 2. Sherwin-Williams Co. (S-W)
 - 3. Or equal.

2.02 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names 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 under "Substitutions" in Section 01 61 00 Product Requirements.

PART III - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting. Art and signage will be removed by the University. Notify the University's representative well in advance of the intended removal date.
 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved. Notify University's representative to reinstall items the University removed.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5% solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or

- plastic wood filler. Sand smooth when dried.
- b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
- a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.03 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. 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 the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
1. 0
- F. Electrical items to be painted include, but are not limited to, the following:
1. Conduit and fittings.
 2. Switchgear.
 3. Panelboards.
- G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

- H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats.
- K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 FIELD QUALITY CONTROL

- A. The University reserves the right engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 - 1. The University may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.05 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.06 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.07 INTERIOR PAINT SCHEDULE

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Flat Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore Paints (KM) 971 Acry-Plex PVA Primer
 - 2) Sherwin-Williams Co. (S-W) Preprite ProMar 200 Latex Wall Primer, B28W200
 - 3) Or equal.
 - b. First and Second Coats: Flat, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.
 - 1) Kelly Moore, (KM) 550 Premium Flat
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Flat, B30W200 series
 - 3) ICI Paints 1210 Ultra-Hide Acrylic Flat
2. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore, (KM) 971 PVA Primer
 - 2) Sherwin-Williams Co. (S-W) Preprite ProMar 200 Latex Wall Primer, B28W200
 - 3) ICI Paints 1030 Ultra-Hide PUA
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
 - 1) Kelly Moore (KM) 1510 Premium Eggshell Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Egshel, B20W200 series

- 3) Or equal.
3. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 971 PVA Primer
 - 2) Sherwin-Williams Co. (S-W) Preprite ProMar 200 Latex Wall Primer, B28W200
 - 3) Or equal.
 - b. First and Second Coats: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Kelly Moore (KM) 1650 Premium Semi-Gloss
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Semi-Gloss, B31W200 series
 - 3) Or equal.
4. Semi-gloss, Alkyd-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 971 PVA Primer
 - 2) Sherwin-Williams Co. (S-W) Preprite ProMar Interior Latex Wall Primer, B28W200
 - 3) Or equal.
 - b. First and Second Coats: Odorless, semi-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Kelly Moore (KM) 1930 Professional Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) Classic 99 Alkyd Semi-Gloss, A40 series
 - 3) Or equal.
5. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

- 1) Kelly Moore (KM) 971 PVA Primer
 - 2) Sherwin-Williams Co. (S-W) Preprite ProMar 200 Latex Wall Primer, B28W200
 - 3) Or equal.
- b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).
- 1) Kelly Moore (KM) 1680 Dura-Poxy Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Interior Latex Gloss, B21W200 series
 - 3) Or equal.
6. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a primer.
- a. Primer: Alkyd- or latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
- 1) Kelly Moore (KM) 971 PVA Primer
 - 2) Sherwin-Williams Co. (S-W) Preprite ProMar 200 Latex Wall Primer, B28W200
 - 3) Or equal.
- b. First and Second Coats: Odorless, full-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.
- 1) Kelly Moore (KM) 1980 Professional Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) Industrial Enamel, B54Z-400 series
 - 3) Or equal.
- B. Ferrous Metal: Provide the following finish systems over ferrous metal:
1. Flat Acrylic Finish: 2 finish coats over a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.

 - 1) Rust Oleum CV740
 - 2) Sherwin-Williams Co. (S-W) Kem Bond HS, B50-Z series
 - 3) Or equal.

- b. First and Second Coats: Flat, acrylic-latex, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.
 - 1) Kelly Moore (KM) 550 Premium Flat
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Flat, B30W200 series
 - 3) Or equal.
- 2. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
 - 1) Rust Oleum CV740
 - 2) Sherwin-Williams Co. (S-W) Kem Bond HS, B50-Z series
 - 3) Or equal.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
 - 1) Kelly Moore (KM) 1510 Premium Eggshell Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Egshel, B20W200 series
 - 3) Or equal.
- 3. Semi-gloss, Acrylic-Enamel Finish: One finish coat over an enamel undercoater and a primer.
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
 - 1) Rust Oleum CV740
 - 2) Sherwin-Williams Co. (S-W) Kem Bond HS, B50-Z series
 - 3) Or equal.
 - b. Undercoat: Alkyd, interior enamel undercoat or semi-gloss, acrylic-latex, interior enamel, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.

- 1) Kelly Moore (KM) 1650 Premium Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Semi-Gloss, B31W200 series
 - 3) Or equal.
- c. Finish Coat: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.
- 1) Kelly Moore (KM) 1650 Premium Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Semi-Gloss, B31W200 series
 - 3) Or equal.
4. Semi-gloss, Alkyd-Enamel Finish: One finish coat over an enamel undercoater and a primer.
- a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
- 1) Rust Oleum CV740
 - 2) Sherwin-Williams Co. (S-W) Kem Bond HS, B50-Z series
 - 3) Or equal.
- b. Undercoat: Alkyd, interior enamel undercoat or semi-gloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
- 1) Kelly Moore (KM) 1930 Professional Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) Classic 99 Alkyd Semi-Gloss, A40 series
 - 3) Or equal.
- c. Finish Coat: Odorless, semi-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils.
- 1) Kelly Moore (KM) 1930 Professional Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) Classic 99 Alkyd Semi-Gloss, A40 series
 - 3) Or equal.

5. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
 - 1) Rust Oleum CV740
 - 2) Sherwin-Williams Co. (S-W) Kem Bond HS, B50-Z series
 - 3) Or equal.
 - b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.
 - 1) Kelly Moore (KM) 1680 Dura-Proxy Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Gloss, B21W200 series
 - 3) Or equal.
6. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over an enamel undercoater and a primer.
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
 - 1) Rust Oleum CV740
 - 2) Sherwin-Williams Co. (S-W) Kem Bond HS, B50-Z series
 - 3) Or equal.
 - b. Undercoat: Alkyd, interior enamel undercoat or full-gloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 1980 Professional Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) Industrial Enamel, B54Z-400 series
 - 3) Or equal.
 - c. Finish Coat: Full-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 1980 Professional Gloss Enamel

- 2) Sherwin-Williams Co. (S-W) Industrial Enamel, B54Z-400 series
 - 3) Or equal.
- C. Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal:
1. Flat Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 5725 DTM Primer/Finish
 - 2) Sherwin-Williams Co. (S-W) Galvite HS, B50WZ30
 - 3) Or equal.
 - b. First and Second Coats: Flat, acrylic-latex, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.
 - 1) Kelly Moore (KM) 550 Premium Flat
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Flat, B30W200 series
 - 3) Or equal.
 2. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 5725 DTM Primer/Finish
 - 2) Sherwin-Williams Co. (S-W) Galvite HS, B50WZ30
 - 3) Or equal.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
 - 1) Kelly Moore (KM) 1510 Premium Eggshell Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Egshel, B20W200 series
 - 3) Or equal.
 3. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.

- a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 5725 DTM Primer/Finish
 - 2) Sherwin-Williams Co. (S-W) Galvite HS, B50WZ30
 - 3) Or equal.
 - b. First and Second Coats: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Kelly Moore (KM) 1650 Premium Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Semi-Gloss, B31W200 series
 - 3) Or equal.
4. Semi-gloss, Alkyd-Enamel Finish: One finish coat over an undercoat and a primer.
- a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 5725 DTM Primer/Finish
 - 2) Sherwin-Williams Co. (S-W) Galvite HS, B50WZ30
 - 3) Or equal.
 - b. Undercoat: Alkyd, interior enamel undercoat or semi-gloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 1930 Professional Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) Classic 99 Alkyd Semi-Gloss, A40 series
 - 3) Or equal.
 - c. Finish Coat: Odorless, semi-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils.
 - 1) Kelly Moore (KM) 1930 Professional Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) Classic 99 Alkyd Semi-Gloss A40 series

- 3) Or equal.
5. Full-Gloss, Acrylic-Enamel Finish: 2 coats over a primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 5725 DTM Primer/Finish
 - 2) Sherwin-Williams Co. (S-W) Galvite HS, B50WZ30 series
 - 3) Or equal.
 - b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.
 - 1) Kelly Moore (KM) 1680 Dura-Proxy Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) ProMar 200 Latex Gloss, B21W200 series
 - 3) Or equal.
6. Full-Gloss, Alkyd-Enamel Finish: One finish coat over an enamel undercoater and a primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 5725 DTM Primer/Finish
 - 2) Sherwin-Williams Co. (S-W) Galvite HS, B50WZ30
 - 3) Or equal.
 - b. Undercoat: Alkyd, interior enamel undercoat or semi-gloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 1930 Professional Semi-Gloss Enamel
 - 2) Sherwin-Williams Co. (S-W) Industrial Enamel, B54-Z400 series
 - 3) Or equal.
 - c. Finish Coat: Full-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Kelly Moore (KM) 1980 Professional Gloss Enamel

- 2) Sherwin-Williams Co. (S-W) Industrial Enamel, B54-Z400 series
- 3) Or equal.

END OF SECTION 09 90 00

**SECTION 10 26 00
WALL AND DOOR PROTECTION**

PART I - GENERAL

1.01 DESCRIPTION

- A. Scope: Work under this Section shall include all materials and installation necessary to provide Impact-Resistant Wall Protection including Wall guards, Handrails, Bed locators, Corner guards, Sheet and panel wall coverings, Kick and armor plates as shown and detailed on the Drawings and specified herein.
- B. Related Sections include the following:
 - 1. Division 5, Section 05 50 00 – METAL FABRICATIONS for steel angle and bent plate corner guards fabricated from rolled metal.
 - 2. Division 8 – DOOR HARDWARE for stainless-steel mop, kick, armor, and push plates.

1.02 SUBMITTALS

- A. Product Data: Include physical characteristics, such as durability, resistance to fading, and flame resistance, for each impact-resistant wall protection system component indicated.
- B. Samples for Review and approval: Provide a minimum of 2 samples from the manufacturer for each color and texture of wall or door protection specified.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installation of impact-resistant wall protection system components similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing impact-resistant wall protection system components similar to those required for this Project and with a record of successful in-service performance.
- C. Source Limitations: Obtain each color, grade, finish, and type of impact-resistant wall protection system component from a single source with resources to provide components of consistent quality in appearance and physical properties.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for systems aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight-lines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection system and are based on the specific system indicated.

- F. Fire-Test-Response Characteristics: Provide impact-resistant wall protection system components with the following surface-burning characteristics, as determined by testing materials identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify impact-resistant wall protection system components with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.
- G. Impact Strength: Provide impact-resistant wall protection system components with a minimum impact resistance of 25.4 ft.-lb./in. of width when tested according to ASTM D 256, Test Method A.

1.04 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install wall surface-protection system components until the space is enclosed and weatherproof and ambient temperature within the building is maintained at not less than 70°F for not less than 72 hours before beginning installation. Do not install rigid plastic wall surface-protection systems until that temperature has been attained and is stabilized.

PART II - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacture for Hand Rails, Crash Rails, Corner Guards, Door and Wall Protection:
 - 1. InPro, Pawling, or equal.

2.02 MATERIALS

- A. Extruded Rigid Plastic, Textured, chemical and stain-resistant, high-impact-resistant, PVC or acrylic-modified vinyl plastic; thickness as indicated with a minimum impact resistance of 25.4 ft. – lb./in. of width when tested according to ASTM D 256, Test Method A. .
 - 1. Color and Texture: Match Existing.
- B. Aluminum Extrusions: Provide alloy and temper recommended by the manufacturer for the type of use and finish indicated, but with not less than the strength and durability properties specified in ASTM B 221 for alloy 6063-T5.
- C. Fasteners: Provide aluminum, nonmagnetic stainless-steel, or other non-corrosive metal screws, bolts, and other fasteners compatible with aluminum components, hardware, anchors, and other items being fastened. Use theft-proof fasteners where exposed to view.

2.03 HANDRAILS

- A. Bumper-Rail-Type Handrails: 5 ½” high Impact-resistant, resilient handrail assembly consisting of a snap-on plastic cover installed over a continuous aluminum retainer mounted at height indicated. Comply with ANSI/CABO A117.1.

1. Cover: Extruded, rigid plastic, minimum 0.080" thick, in dimensions and profiles indicated.
2. Retainer: Continuous, one-piece, extruded-aluminum retainer; minimum 0.080" thick; with continuous rubber or vinyl bumper cushion centered in the extrusion.
3. Mounting Bracket: Extended mounting on high-impact, prefabricated, injection-molded, plastic mounting brackets. Provide mounting hardware and other accessories as required.
4. Accessories: Provide prefabricated, injection-molded end caps and inside and outside corners with concealed splices, cushions, and other accessories as required.
 - a. End caps and inside and outside corners shall match plastic cover color and shall be field adjustable for close alignment with snap-on plastic covers.

2.04 CORNER GUARDS

- A. Surface-Mounted, Resilient Plastic Corner Guards: Surface-mounted, resilient plastic corner-guard assembly consisting of a snap-on-type plastic cover installed over a continuous aluminum retainer, height as indicated.
- B. Flush-Mounted, Resilient Plastic Corner Guards: Height; from top of wall base to ceiling, flush-mounted, resilient plastic corner-guard assembly consisting of a snap-on-type plastic cover installed over a continuous aluminum retainer.
 1. Cover: Extruded, rigid plastic, minimum 0.040" thick, in dimensions and profiles indicated.
 - a. Corner Radius: ¼".
 - b. Corner Radius: 1-¼".
 2. Retainer: Continuous, one-piece, extruded-aluminum retainer; minimum 0.062" thick.
 3. Accessories: Provide prefabricated, injection-molded top cap and aluminum base with concealed splices, cushions, mounting hardware, and other accessories as required.
 - a. Top caps shall match color of plastic covers and shall be field adjustable for close alignment with snap-on plastic covers.
- C. Stainless-Steel Corner Guards: Paper-covered, satin-finish, 0.0625" minimum, stainless-steel sheet corner guards; height as indicated. Provide 90° turn, unless otherwise indicated; and formed edges.

2.05 DOOR PROTECTION SYSTEMS

- A. Door Surface Protection: Protection plates; 0.060" thick minimum; fabricated from embossed, chemical and stain-resistant, extruded, rigid plastic with beveled edges; and complying with fire-test-response characteristics specified, ANSI/BHMA A156.6, and the following:

1. Kick Plate: 12" high by 1" less than door width.
 2. Armor Plate: 32" high by 1" less than door width.
 3. Push Plate: 16" high by 4" wide.
- B. Heavy Duty Door Edge Protector: Stainless steel, type 430, 16 gauge, U-shaped 90°
1. Strike side of door – height to underside of strike
 2. Hinge side of door – preferred full height with breaks at door hinges

2.06 FABRICATION

- A. General: Fabricate impact-resistant wall and door protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including thickness' of components.
- B. Pre-assemble components in the shop to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
- D. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors for interconnecting members to other construction.
- E. Provide inserts and other anchoring devices for connecting components to concrete or masonry. Fabricate anchoring devices to withstand imposed loads. Coordinate anchoring devices with the supporting structure.

2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART III - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions in which impact-resistant wall protection system components and impact-resistant wall covering materials will be installed.
1. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

- B. Impact-Resistant Wall Covering Materials: Wall surfaces to receive impact-resistant wall covering materials shall be dry and free from dirt, grease, loose paint, and scale.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. General: Before installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

- A. Install impact-resistant wall protection system components level, plumb, and true to line without distortions.
 - 1. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Install aluminum retainers, mounting brackets, and other accessories according to the manufacturer's written instructions.
 - 1. Where splices occur in horizontal runs of more than 20' (6.1 m), splice aluminum retainers and plastic covers at different locations along the run.

3.04 CLEANING

- A. General: Immediately on completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent. Clean metal components according to the manufacturer's written instructions.
- B. Remove excess adhesive using methods and materials recommended by the manufacturer.

END OF SECTION 10 26 00

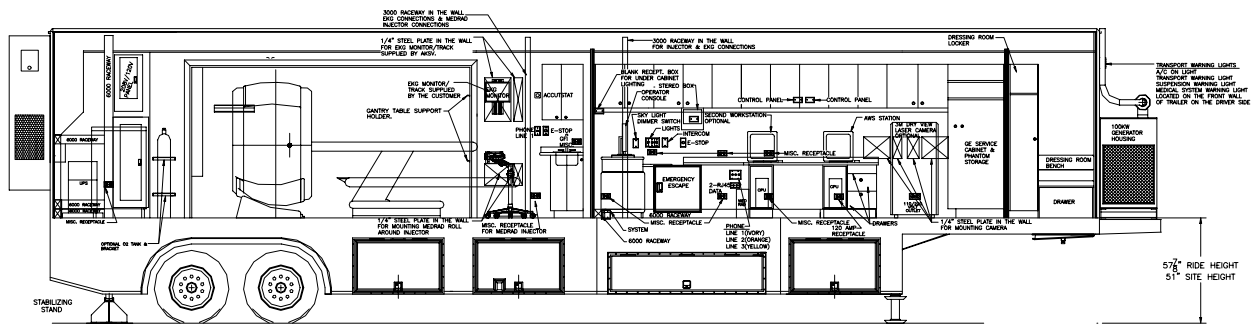
SECTION 11 70 00
CT MOBILE UNIT / PREFABRICATED MODULAR ALUMINUM STAIR SYSTEM

PART I – CT MOBILE UNIT

- A. General CT Mobile Unit Requirements - See attached product information.

Site Planning Guide

GE Mobile LightSpeed CT System 48'x102" Wide USA Unit



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List of Revisions

Revisions

00	Initial release	October 2002
01	Added Ground Connection Clarification	January 2003
02	Added Clarification to Data Cable Requirements	June 2003
03	Updated Specs & Added A/C Clearance Requirement	August 2004

Notice

In accordance with our policy of continued product improvement, AK Specialty Vehicles reserves the right to make changes in the equipment, design, specifications, and materials of the product described herein. Any problems or questions related to the components or systems covered in this booklet may be directed to:

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Introduction

The purpose of this document is to provide the basic information needed for site planning. For specific information not contained in this document, please contact AK Specialty Vehicles.

The mobile unit requires sufficient room to be maneuvered and positioned for setup and takedown. The mobile unit has many storage compartments and service doors that require access during these procedures as well as during operation. The expanding wall sections, patient lift, entry stairs, and optional platform require additional space on the right side of the mobile unit. Refer to the drawings provided for actual locations of doors, patient lift, and stair sizes and locations.

Warnings & Safety Alert Conventions

Three types of statements are used throughout this document to warn the operator of potential situations. Always read these statements carefully and take the appropriate safety precautions to ensure a safe environment for all personnel and all property. The statements are as follows:



This type of notice indicates a potentially hazardous situation, which if not avoided, could result in injury or death to the operator of the mobile unit.



This type of notice indicates a potentially hazardous situation, which if not avoided, could result in irreparable damage to the mobile unit.



This type of notice is meant to inform the operator of useful information.

Support Pad Requirements

IMPORTANT

If other modalities utilize the same support pad, it is recommended that non-ferrous reinforcement materials be used for pad reinforcement.

IMPORTANT

GE must approve plans for pad construction.

The following is a list of recommendations and requirements for a concrete support pad. However, due to varying site conditions, the actual pad design should be prepared by an appropriately licensed structural or architectural engineer.

Trailer Weight

The weight of the trailer should be considered in the design of the support and service pads. The overall weight of the trailer is approximately 67,800 lbs. The weight on the rear axles is approximately 32,780 lbs. The weight on the King Pin is approximately 15,740 lbs.

Recommended Support Pad Requirements

The measurements for the recommended support pad are as follows, 10'-11" x 40'-8". The cross hatching as shown on [Figure 2: Plan Layout](#) and [Figure 3: Right Side Elevation](#) represents the recommended support pad.

Recommended Service Pad

The measurements for the recommended service pad are as follows, 21'-0" x 58'-0". This will allow full service access to the mobile unit. The recommended service pad is shown on [Figure 2: Plan Layout](#) and [Figure 3: Right Side Elevation](#).

Support Pad Depth

Recommendations for the width and length of the pad are given above. Based upon the existing site conditions, the depth should be determined by a local contractor.

Support Pad Levelness

In order to ensure proper operation of the LightSpeed CT system, the support pad(s) must be level and the deviation must not exceed .125" in 10'-0".

Electro Magnetic Interference

The ambient static magnetic field within the region of the gantry should not exceed 1 Gauss (10^{-4} Tesla).

Vehicle Access

A firm, level surface is required around the mobile unit in order to provide access to the site, patient access to the mobile unit, and servicing of the mobile unit.

Recommended Attachment to the Facility

An inflatable air bag or soft seal is recommended at the point of connection from the unit to the facility. Fixed or solid connections may hinder imaging quality. Contact AK Specialty Vehicles or the local GE representative prior to construction if the proposed connection varies from the recommended.

Air Conditioning Air Flow Clearance

The following clearances for acceptable air conditioning condenser air flow have been established between wall-mounted equipment and opposing units or surfaces for maximum capacity, lowest operating cost, satisfactory operation of ventilation packages, and longest service life

- Unit discharging against opposing (facing) unit – 20 feet from coil grill to coil grill
- Unit discharging against a wall or essentially solid barrier – 15 feet from coil grill to wall.

See [Figure 2: Plan Layout](#).

Swing Clearance Note

Please verify the actual dimensions of the rearmost projections on the cab of your tractor to the centerline of tandem suspension or centerline of the fifth wheel plate on your tractor. Refer to [Figure 9: Turning Requirements](#) for proper tractor sizing information.

Radiation Shielding Requirements

Radiation Shielding

IMPORTANT

Radiation exposure limits must be in accordance with all local, state, and federal requirements. It is the responsibility of the customer to perform a proper radiation survey in order to determine the exclusion zone.

Care should be taken when determining a site location. Factors such as shielding design, proximity to buildings, and occupancy of the surrounding areas must be considered. An exclusion zone around the mobile unit may be necessary. Refer to [Figure 5: Radiation Shielding Plan View](#) for additional information.

Radiation Field Information

It is the responsibility of the customer to ensure a safe environment with respect to the radiation field. Due to radioactivity levels associated with pet patient handling and diagnostic procedures used in CT scanning, an exclusion zone must be maintained while in use.

Customer must contact their local Radiation Safety Operation Official for the federal, state, and local guidelines and must comply with these safety requirements.

Operator needs to make their own exposure dose measurements to include radiation from patients when determining the outside "Keep Away Zone" (chained-off area).

Customer Power Requirements



It is the operator's responsibility to verify that the shore power receptacle is of the same type and voltage as the connection that is supplied by AK Specialty Vehicles. Failure to do this can result in injury or death to the operator of the mobile unit as well as irreparable damage to the mobile unit.



The standard connector for the unit is a Russellstoll DS 2504 MP000/DF2032, 480V 200A Plug. If an existing site currently implements a different connector or connector configuration, please contact AK Specialty Vehicles in order to arrange for a compatible power connector before the unit leaves the facility.

Lockout/Tagout

A Lockout/Tagout provision in accordance with OSHA Standard 1910.147 is required. The facility shore power disconnect device must be located within 40'- 0" of the unit and must provide for an effective lockout/tagout to facilitate safe service and maintenance of the unit.

Electrical Service

A single electrical power source is required for operation of the CT system. 3/N/PE AC 480V service fused at 150 amperes.

Configuration

Three phase, five wire, wye connection, with neutral and ground. (5 wire 3/N/PE AC 480V)

Load Regulation at Line Frequency

Wires are to be sized such that the line voltage drops from the power source to the mobile unit is less than 2.5% of the nominal voltage for the rated load of the mobile unit.

Frequency

60Hz \pm 2.0Hz.

Phase Balance

The phase balance is 3% maximum of lowest phase-to-phase voltage.

Maximum Voltage Variation

The maximum voltage variation is \pm 10% from a nominal steady state (under the worst case conditions of line voltage).

Connector Type

The mobile unit is supplied with a 50'-0" power cable and male conductor. Unless otherwise specified, the connector type is a Russellstoll DS2504MP000/DF2032, 480V 200A rated plug.

Customer Facility

The customer facility must have the matching receptacle as specified in [Figure 7: Russellstoll Receptacle, Service Disconnect](#) and [Figure 8: Russellstoll Receptacle Chart](#). Unless otherwise specified, the receptacle type to be used must be a Russellstoll DF2504FRAB0 female connector.

Input Power

- Frequency: 60Hz \pm 2.0 Hz
- Regulation: Load regulation must not exceed 2.5%.
- Phase Imbalance: The difference between the highest line-to-line voltage and lowest line-to-line voltage must not exceed 3% of the lowest line-to-line voltage.

Power Source Monitoring (Facility Only)

NOTE: Perform a power audit first.

A power analyzer should be used to check the proposed Mobile CT Series facility site power for average line voltage, surges, sags, reclosures, impulses, frequency and microcuts. A period that includes two weekends should be used to simulate several days of normal use. Analysis of the data and site history of any previous power problems with other X-ray systems or computer installations should be reviewed with your power and ground representative. Verify "brown-out" (low voltage) conditions, which may occur during summer months, will not exceed the allowable range.

Some analyzer models that are suitable for power monitoring are:

- Dranetz Model 658
- Dranetz Model 656A
- BMI 3630
- RPM

Mobile Grounding Requirements

Special Ground Note

The unit must have an earth driven ground rod within five (5) feet of the hospitable power receptacle. A grounding cable of a minimum #1/0 AWG must be connected between the grounding rod and the grounding pin of the hospitable power receptacle. Another cable to be kept as short as possible, may also be connected between the ground stud on the Incoming Power Distribution Panel and an earth driven ground rod. See [Figure 1: Ground Connection](#) below. A separate grounding conductor must still be run with the phase conductors to the source of power from the grounding pin of the hospitable power receptacle in accordance with NEC 2002 Article 250-24.



[Figure 1: Ground Connection](#)

Mobile Grounding Chart

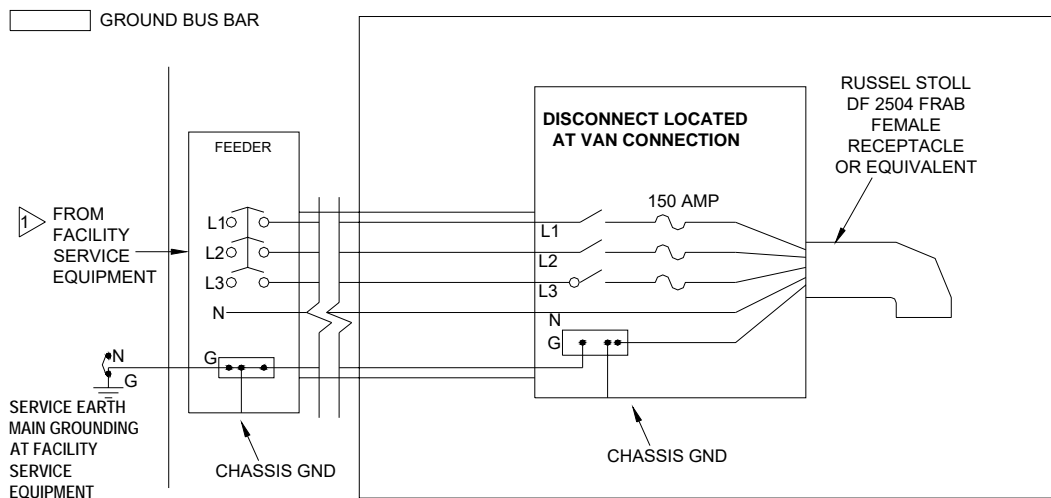
MOBILE GROUNDING REQUIREMENTS

NOTE:

- ALL WORK TO BE DONE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES INFORMATION SHOWN HERE IS ONLY A RECOMMENDATION. MUST BE VERIFIED FOR SITE NATIONAL AND LOCAL CODES.

- GROUND WIRES INSIDE ENCLOSURES TO BE TAPED GREEN FOR ENTIRE VISUAL LENGTH FOR IDENTIFICATION.

▷ MAIN BONDING JUMPER BETWEEN GROUNDED (NEUTRAL) CONDUCTOR AND EQUIPMENT GROUNDING CONDUCTOR TO BE PROVIDED IN FACILITY SERVICE EQUIPMENT AND DOWNSTREAM AT SEPARATELY DERIVED SYSTEM TRANSFORMER SECONDARY AS SHOWN.



GROUNDING

The ground for our system shall originate at the system power source, i.e., transformer or first access point of power into a facility, and be continuous to our system power disconnect in the room. This ground can be spliced with "High Compression Fittings" and should be terminated at each distribution panel it passes through. When it is broken for a connection to a panel, it shall be connected into an approved grounding block with the incoming and outgoing ground in this same grounding block, which is then connected to the steel panel never using the steel panel never using the steel or other material of the panel as the block

The connection at the power source shall be at the grounding point of the "Neutral-Ground" if a "Wye" transformer is used, or typical grounding points of a separately derived system. In the case of an external facility, it shall be bonded to the facility ground point at the service entrance.

GROUNDING WIRE

The ground wire shall be copper wire with a minimum of AWG 1/0 or the same size as the power feeders whichever is larger. This means that if there is a primary feeder to a distribution panel of 500 MCM with a secondary feeder to our system of AWG 1/0 wire, the ground to the distribution panel shall be 500 MCM with and AWG 1/0 to our system. The ground wire impedance from our system disconnect, including the ground rod shall not have an impedance greater than 2 ohms to earth as measured by one of the applicable techniques described in Section 4 of ANSI/IEEE Standard 142-1982.

Harry E. Rauworth
Debra C. Balis
April 22, 1999

Telephone and Data Service Requirements

Telephone Service

The mobile unit is supplied with three (3) telephone connections. The connector type that is used is a Hubbell model PH-6595 (inlet) with a model PH-6624 connector body.

The customer is required to purchase and install three (3) Hubbell all weather telephone connections, model PH-6597 for use at the site.

Three Hubbell model PH-6599 telephone-connecting cables are included with the mobile unit. The cables measure 50'-0" in length.

Data Service

The mobile unit is supplied with three (3) data line connections that utilize RJ-45 outlets.

The customer is required to purchase and install the data connection cables for use with the data line connections. The data line connections require a 50'-0" CAT-5E cable with RJ-45 connections.

Water Requirements

IMPORTANT

During winter conditions, provisions must be made to ensure that water lines do not freeze because of weather conditions.

Water Supply Tank

A 15-gallon water supply tank is located on the left side of the mobile unit in the underbody compartments, which supplies the HVAC system as well as the optional onboard sink.

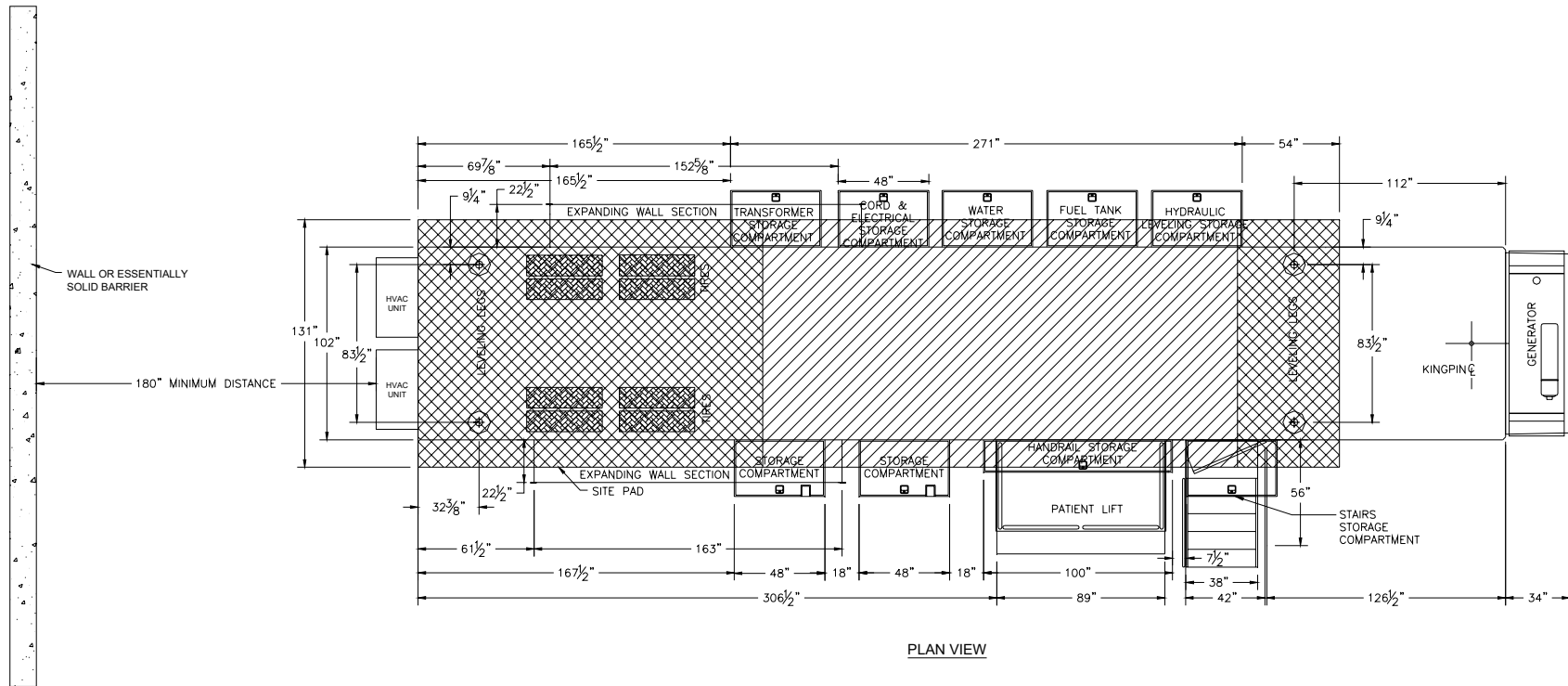
The water supply tank can be filled from within the compartment by using the supplied adapter, or from the exterior of the mobile unit by using the connection on the underbody compartment door and the supplied hose.

The drain for the water supply tank is located below the underbody compartment door. The drain valve is located in the underbody compartment.

Waste Water Tank

A 15-gallon wastewater tank is located on the left side of the mobile unit in the underbody compartments to be used with the optional onboard sink.

The drain for the wastewater tank is located below the underbody compartment door. The drain valve is located in the underbody compartment.



NOTE: IF TWO UNITS ARE PARKED BACK TO BACK, A MINIMUM DISTANCE OF 20' MUST BE MAINTAINED FROM COIL GRILL TO COIL GRILL OF THE A/C UNITS.

Figure 2: Plan Layout

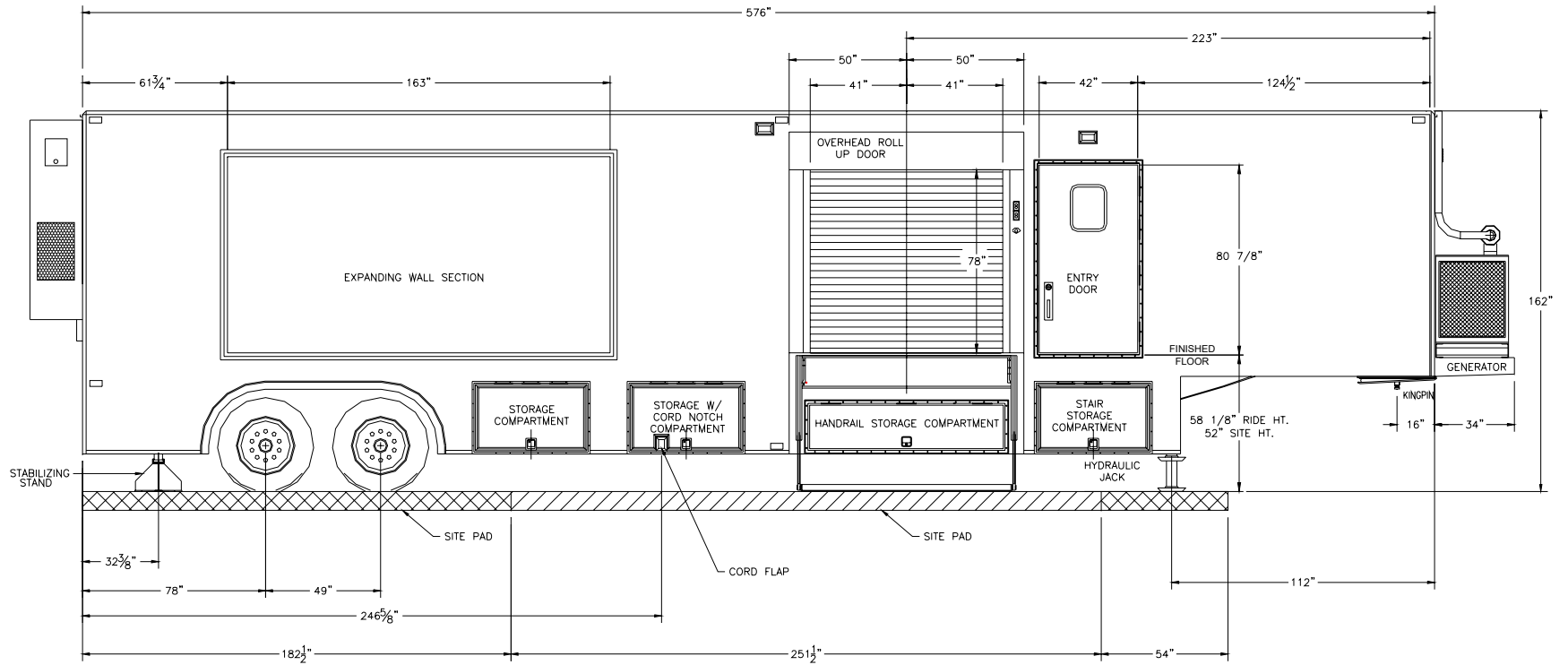


Figure 3: Right Side Elevation

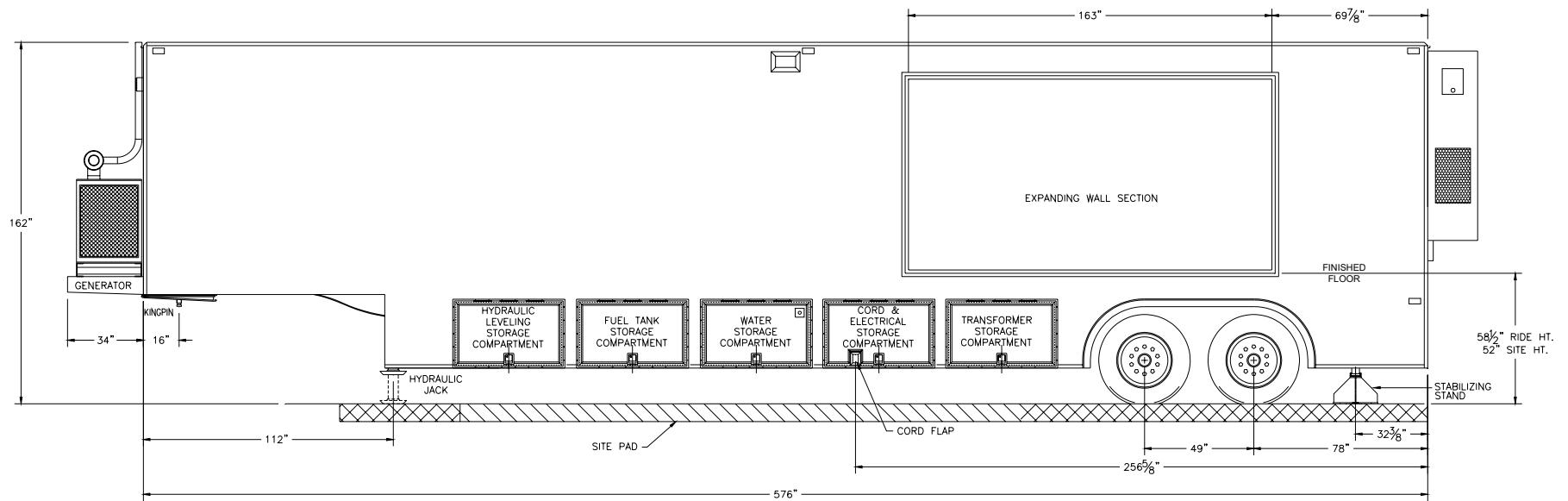


Figure 4: Left Side Elevation

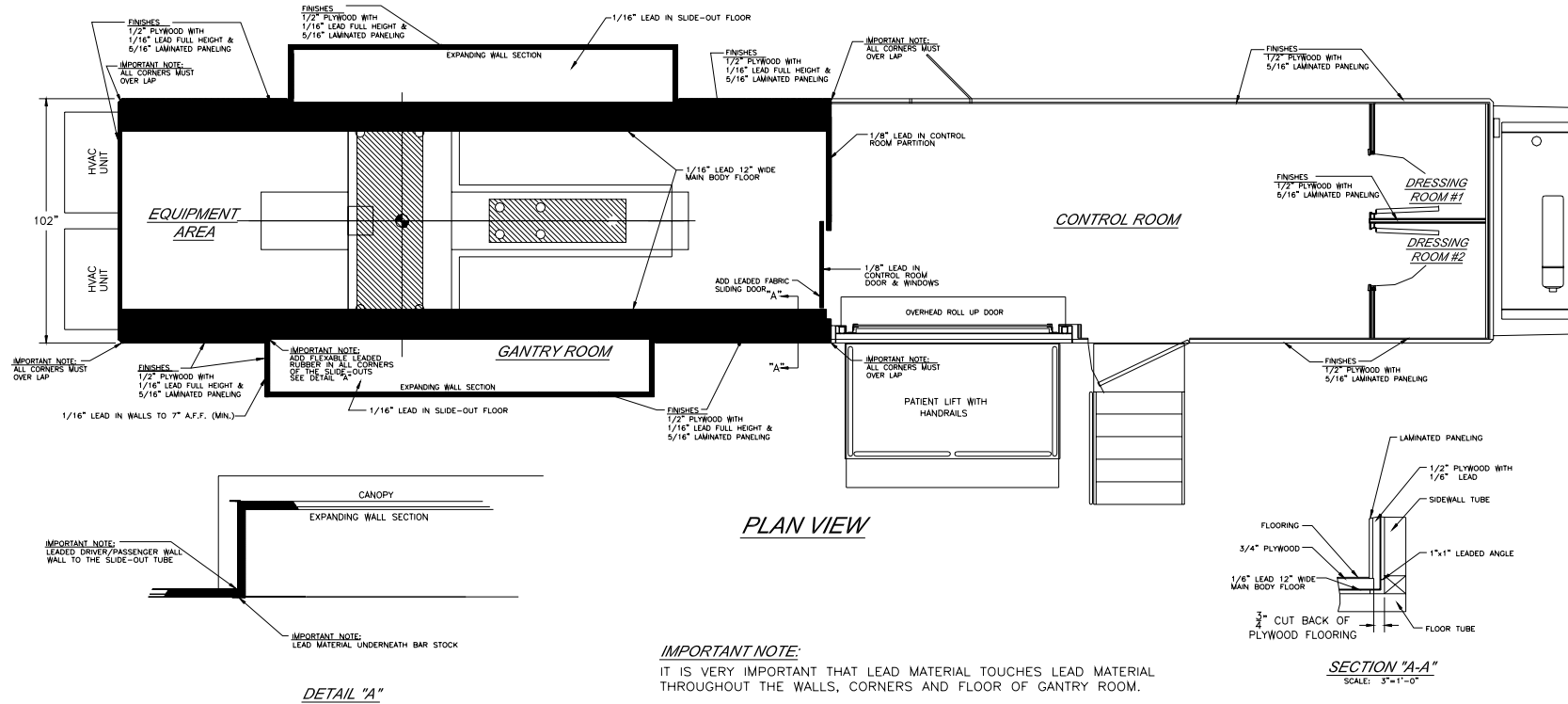


Figure 5: Radiation Shielding Plan View

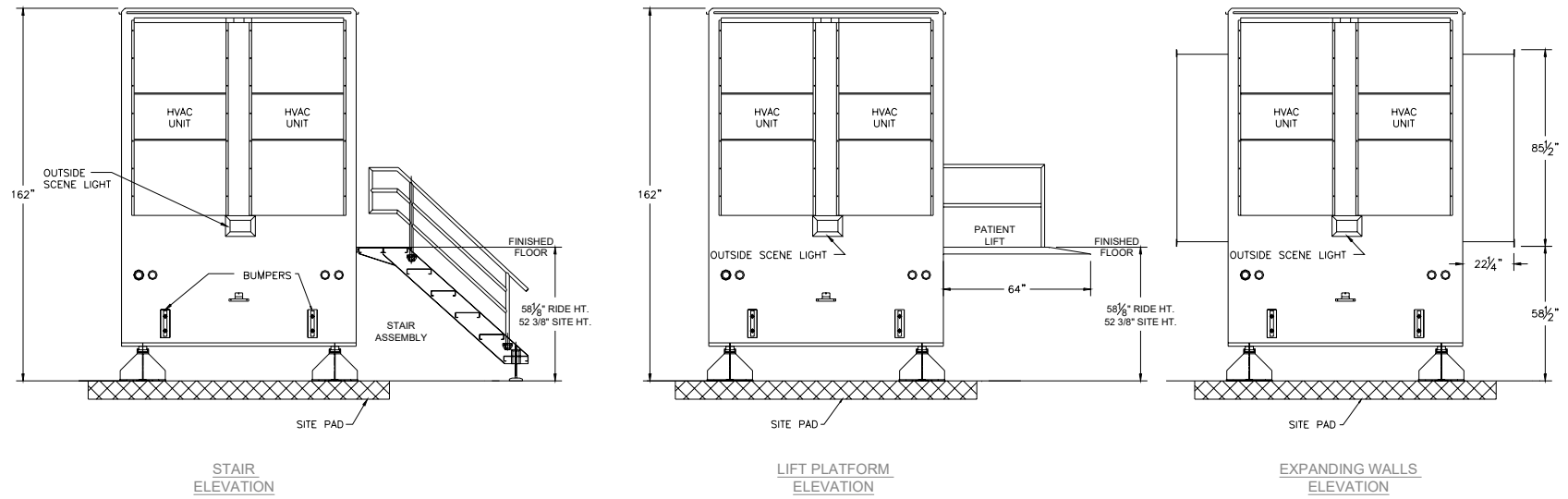


Figure 6: Stair / Lift / Wall Elevation

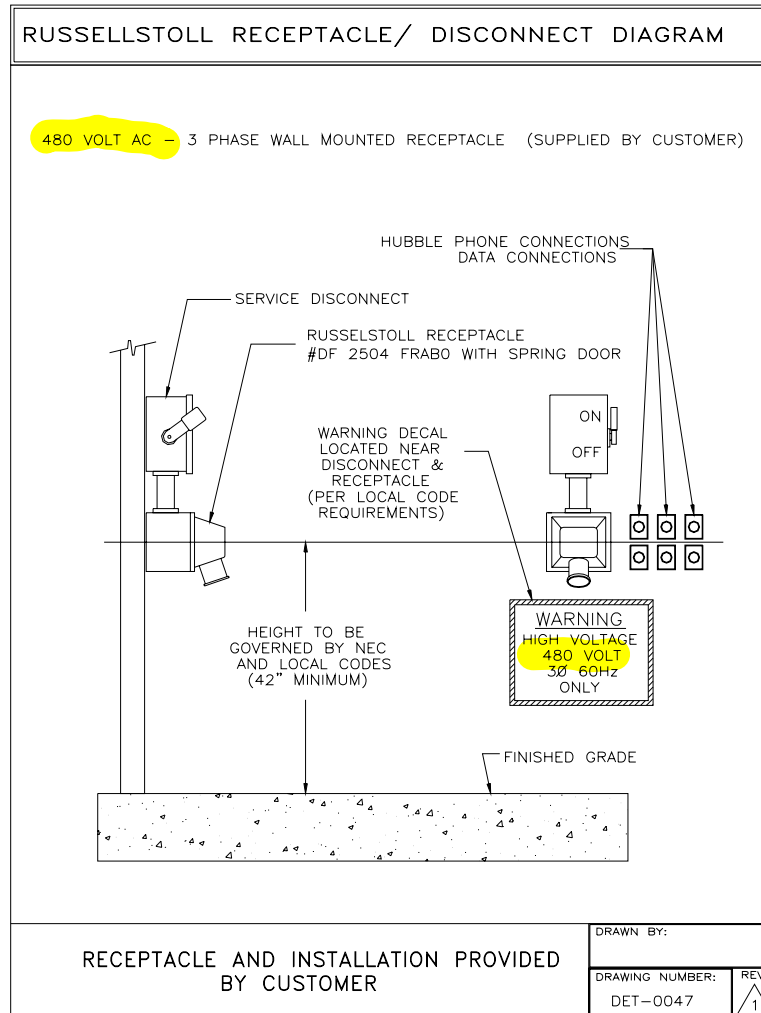


Figure 7: Russellstoll Receptacle, Service Disconnect

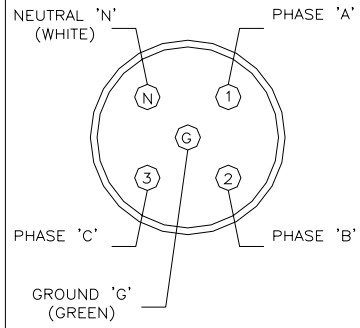
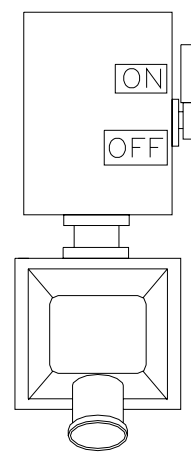

RUSSELLSTOLL RECEPTACLE CHART			
AMP / WIRE	DESCRIPTION		RECEPTACLE
	WIRES	POLES	PART NUMBER
MAXIMUM WIRE SIZE FOR LUG # 1/0	5	4	480 VOLT (200 AMP) 5 WIRE RUSSELLSTOLL RECEPTACLE DF 2504 FRABO THIS RECEPTACLE MUST BE WATERPROOF
480 VOLT AC DEDICATED POWER LINE FROM MAIN TRANSFORMER STATION	3Ø	WYE CONNECTION 150 AMP TOTAL 3Ø NEUTRAL AND GROUND	
RUSSELLSTOLL MATING PLUG PART# DS2504MP000/DF2032 5 WIRE/4 POLE		MAIN DISCONNECT 3/N/PE AC 480 VOLT 150 AMP FUSED DISCONNECT	
			
RECEPTACLE AND INSTALLATION PROVIDED BY CUSTOMER			DRAWN BY: DRAWING NUMBER: DET-0048 REV: 

Figure 8: Russellstoll Receptacle Chart

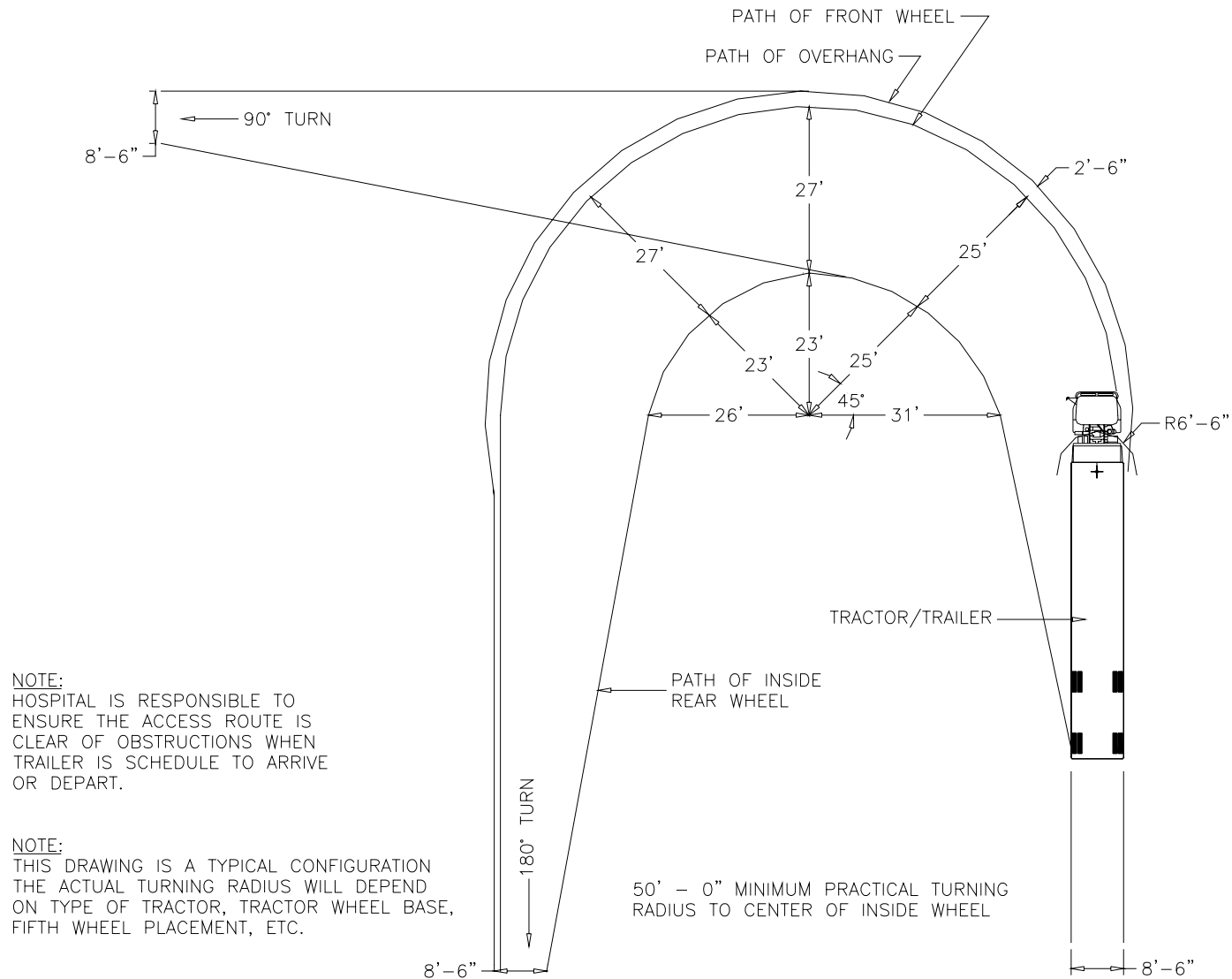


Figure 9: Turning Requirements

PART II – PREFABRICATED MODULAR ALUMINUM STAIR SYSTEM

- A. General Prefabricated Modular Aluminum Stair System Requirements - See attached product information.



Hydro Extrusion USA, LLC (REDD Team)
PREFABRICATED MODULAR ALUMINUM STAIR SYSTEM SPECIFICATIONS

(PLACE AN "X" IN THE BOX NEXT TO ALL APPLICABLE ITEMS)

SCOPE OF WORK: PROVIDE PREFABRICATED MODULAR ALUMINUM STAIR SYSTEMS

3, 4, 5, 6, 7, 8, 9 Riser Series 1007 Stairway

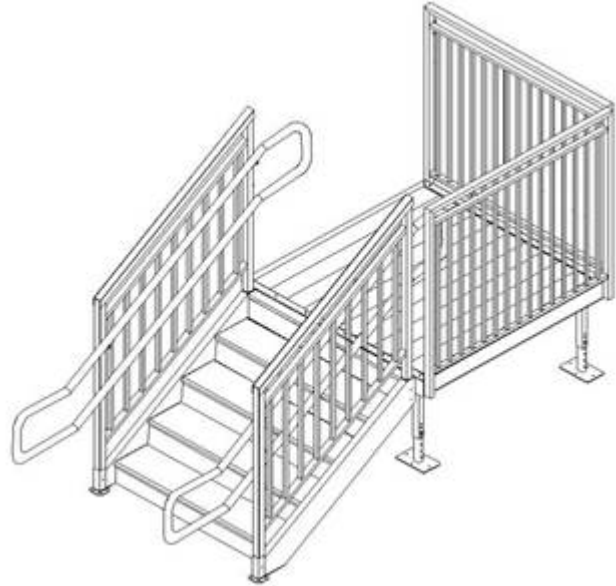
3, 4, 5, 6, 8, 9 Riser Series 1006 Stairway

PART 1 - SUBMITTALS

- 1.1 Product literature with bid.
- 1.2 Warranty information with bid.
- 1.3 Shop drawings (if requested) upon receipt of purchase order.
- 1.4 Engineering: Provide sealed professional engineered drawings upon request.

PART 2 - QUALITY ASSURANCE

- 2.1 Manufacturer: Hydro Extrusion USA, LLC (REDD Team), 125 Superior Drive Delhi, LA 71232. Call toll free: 1-800-779-5509. Fax 1-866-840-4566. Find our web site at <http://www.reddteam.com> or e-mail us at del_reddteam.us@hydro.com. Any alternate manufacturer must be approved prior to bid opening.
- 2.2 All components shall be universal so that a stair system can be relocated and assembled into different configurations.
- 2.3 Design of the aluminum members shall conform to the current edition of the Aluminum Association Specifications and Guidelines for Aluminum Structures.
- 2.4 Aluminum welding shall be in accordance with the ANSI/AWS D1.2-97 GMAW process and shall be performed by experienced operators.
- 2.5 All exposed surfaces shall be smooth and free of sharp or jagged edges.
- 2.6 Warranty: Hydro Extrusion USA, LLC (REDD Team), warrants its products to be free from defects in material and workmanship for a period of (1) one year beginning at date of delivery of product. This warranty excludes any defects resulting from abnormal use in installation or service, accidental or intentional damage or any occurrences beyond the manufacturer's control.



PART 3 - PRODUCTS

- 3.1 **STAIRWAYS** (Always check local ordinances and building codes)
 - 3.1.1 Engineering
 - a. Stair treads and stringers shall be designed for a uniform live load of 100 pounds per square foot and a concentrated vertical load of 300 pounds over an area of 4 square inches.
 - 3.1.2 Materials
 - a. Stair treads, stringers, and risers shall be constructed using 6000 series aluminum alloy with 6061-T6 for primary structural components.
 - 3.1.3 Design
 - a. Stair treads shall be prefabricated in typical 4'-2" width. Custom widths can be fabricated as requested. All treads have ADA compliant nosing.
 - b. Series 1006 stairways shall be prefabricated to match a threshold height of:
 - 18" 24" 30" 36" 48" 54"
 - c. Series 1007 stairways shall be prefabricated to match a threshold height of:
 - 21" 28" 35" 42" 49" 56"
- Minimum walking surface coefficient of friction shall be 0.93 as determined by an independent testing facility.

3.2 **LANDINGS**

3.2.1 Engineering

- a. Landings shall be designed for a uniform live load of 100 pounds per square foot and a concentrated vertical load of 300 pounds distributed uniformly over an area of 1 square foot.

3.2.2 Materials

- a. Landings shall be constructed using 6000 series aluminum alloy with 6061-T6 for primary structural components.

3.2.3 Design

- a. Landings shall be prefabricated in typical 5'-0" X 5'-0" sections.
- b. Landings shall be _____ X _____ sections as indicated on drawings supplied by customer. (Customer shall be responsible for compliance with his or her local ordinances and building codes.)
- c. Landings will be designed for variable heights.
- d. The walking surface of the landing shall be continuous, without gaps, and shall be 1 1/2 inch X 6 inch and/or 1 1/2 inch x 8 inch self-mating aluminum deck with extruded slip resistant surface. Minimum walking surface coefficient of friction shall be 0.93 as determined by an independent testing facility.

3.3 **LEGS**

3.3.1 Engineering

- a. The legs shall be designed to support the stair and landing sections. (See Uniform Live Load Specification 3.1.1.a & 3.2.1.a)

3.3.2 Materials

- a. Legs shall be constructed using 6061-T6 aluminum alloy.
- b. All bolt hardware shall be stainless steel grade 304.

3.3.3 Design

- a. The legs shall telescope to allow for various height adjustments.
- b. All legs shall be thru bolted using stainless steel bolts grade 304.
- c. All legs shall have 1/4" X 6" X 10" pads.

3.4 **LANDING RAILS AND STAIR RAILS**

3.4.1 Engineering

- a. Handrails shall be designed to resist a concentrated load of 200 pounds applied at any point and in any direction at the top of the rail.
- b. Handrails shall be designed to resist a simultaneous load of 50 pounds per linear foot applied horizontally and 100 pounds per linear foot applied vertically downward at the top of the rail.
- c. Guardrail systems shall be designed to resist a 200 pound concentrated horizontal load applied evenly over a one foot square area at any point in the system. (Note: Loads given in section "a", "b", and "c" shall not be applied simultaneously in any combination.)

3.4.2 Materials

- a. All landing rails and stair rails shall be aluminum construction alloy 6061-T6 & 6063-T5.

3.4.3 Design

- a. Stair rail gripping surface shall be smooth and continuous.
- b. Stair hand rail shall be 34" high from the nose of the tread to top of the rail (measured perpendicularly from the tread nose).
- c. Stair top rail shall be 1 1/4" Sch. 40 aluminum pipe with a barrier system of:
 - 4 inch spaced vertical pickets.
 - Two-line pipe (34" high handrail). This option will be quoted on a per-project basis.
- d. Landing rails shall form a 42" high protective barrier such that a 4" sphere cannot pass through any opening in the landing rail.

3.5 **FINISHING**

3.5.1 Landing rails and stair rails shall be:

- a. Mill finish

THIS DRAWING PREPARED FOR:

STEIN ARCHITECT, INC.

SACRAMENTO, CA

THIS DRAWING PREPARED BY:

HYDRO
REDD Team
 Delhi, Louisiana
 1-800-779-5509

PRODUCT REQUESTED:
ALUMINUM STAIR SYSTEM
WITH 34" HIGH VERTICAL PICKET RAILS

CONTRACTOR/PURCHASER IS RESPONSIBLE FOR VERIFYING LAYOUT AS WELL AS ANY CRITICAL DIMENSIONS & THRESHOLD ELEVATIONS PRIOR TO FABRICATION. A SIGNED AND DATED APPROVAL IS REQUIRED TO BEGIN PRODUCTION.

BY SIGNING BELOW, I ACKNOWLEDGE THAT I HAVE REVIEWED ALL CRITICAL INFORMATION THAT IS LISTED WITHIN THIS DOCUMENT AND ASSUME RESPONSIBILITY FOR ANY VARIANCES ON SITE.

DATE _____
 SIGNATURE _____

GENERAL NOTES:

1. ALUMINUM RAMP, LANDING AND STAIR SECTIONS SHALL BE A RIGID, FREE-SPAN DESIGN.
2. DESIGN OF THE ALUMINUM STRUCTURES SHALL CONFORM TO THE CURRENT EDITION OF **THE ALUMINUM ASSOCIATION SPECIFICATIONS AND GUIDELINES FOR ALUMINUM STRUCTURES.**
3. ALL ALUMINUM CONSTRUCTION USING 6000 SERIES ALUMINUM ALLOYS. STRUCTURAL MEMBERS TO BE 6061-T6, 6063-T6 AND 6005-T5 ALUMINUM ALLOY.
4. ALUMINUM WILL BE STANDARD MILL FINISH UNLESS OTHERWISE NOTED.
5. WELDING SHALL BE IN ACCORDANCE WITH ANSI/AWS D1.2/D1.2M-2014 GAS METAL ARC WELDING (GMAW) PROCESS BY EXPERIENCED OPERATORS.
6. ALL FASTENERS TO BE 18-8 (SERIES 304) STAINLESS STEEL UNLESS OTHERWISE NOTED.
7. LANDING, RAMP AND STAIR SECTIONS ARE TO BE ENGINEERED FOR A 100 PSF LIVE LOAD.
8. LANDING AND RAMP WALKING SURFACES SHALL BE DESIGNED FOR A MINIMUM CONCENTRATED VERTICAL LOAD OF 300 LBS APPLIED EVENLY OVER A 12" x 12" AREA. STAIR TREADS SHALL BE DESIGNED TO WITHSTAND A MINIMUM CONCENTRATED LOAD OF 300 LBS OVER A 4 SQUARE INCH AREA.
9. RAMP AND LANDING GUARDRAILS TO BE 42 INCH MINIMUM HEIGHT UNLESS OTHERWISE SPECIFIED. (34 AND 38 INCH TWO-LINE RAMP RAILS AND 34 AND 38 INCH VERTICAL PICKET RAMP RAILS AS WELL AS CUSTOM DESIGN RAMP RAILS AVAILABLE UPON REQUEST FOR SYSTEMS NO MORE THAN 30 INCHES ABOVE FINISHED GROUND LEVEL.)
10. HANDRAIL ASSEMBLIES AND GUARDRAILS SHALL BE DESIGNED TO RESIST A LOAD OF 50 PLF APPLIED IN ANY DIRECTION AT THE TOP OF THE RAIL.
11. HANDRAIL ASSEMBLIES AND GUARDRAILS SHALL BE ABLE TO RESIST A SINGLE CONCENTRATED LOAD OF 200 LBS, APPLIED IN ANY DIRECTION AT ANY POINT ALONG THE TOP OF THE RAIL. THIS LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH THE LOADS SPECIFIED IN THE PRECEDING PARAGRAPH.
12. INTERMEDIATE RAILS (ALL THOSE EXCEPT HANDRAILS), BALUSTERS AND PANEL FILLERS SHALL BE DESIGNED TO WITHSTAND A HORIZONTALLY APPLIED NORMAL LOAD OF 50 LBS ON AN AREA EQUAL TO 1 SQUARE FOOT, INCLUDING OPENINGS AND SPACE BETWEEN RAILS.
13. GUARDRAIL SYSTEMS SHALL BE DESIGNED SO THAT A 4 (FOUR) INCH SPHERE CANNOT PASS THROUGH ANY OPENING.
14. DECK SURFACE SHALL BE A SLIP RESISTANT, EXTRUDED ALUMINUM DECKING WITH A TRIPLE I-BEAM, SELF-MATING DESIGN.
15. ALL SURFACES, MEMBERS AND THEIR WELDED JOINTS SHALL BE SMOOTH AND FREE FROM SHARP OR JAGGED EDGES.
16. ALL DESIGNS SHOWN HEREIN ARE SUBJECT TO CHANGE PENDING FIELD VERIFICATION OF EXISTING CONDITIONS.
17. CONCEALED AND UNEXPOSED SURFACES: WILL NOT BE CLEANED NOR DEBURRED. EXCEPTION (WHEN REQUESTED): UNDERSIDE OF PLATFORMS EXCEEDING 60" IN ELEVATION.
18. **ANCHORING OF PRODUCT TO GRADE BY OTHERS**

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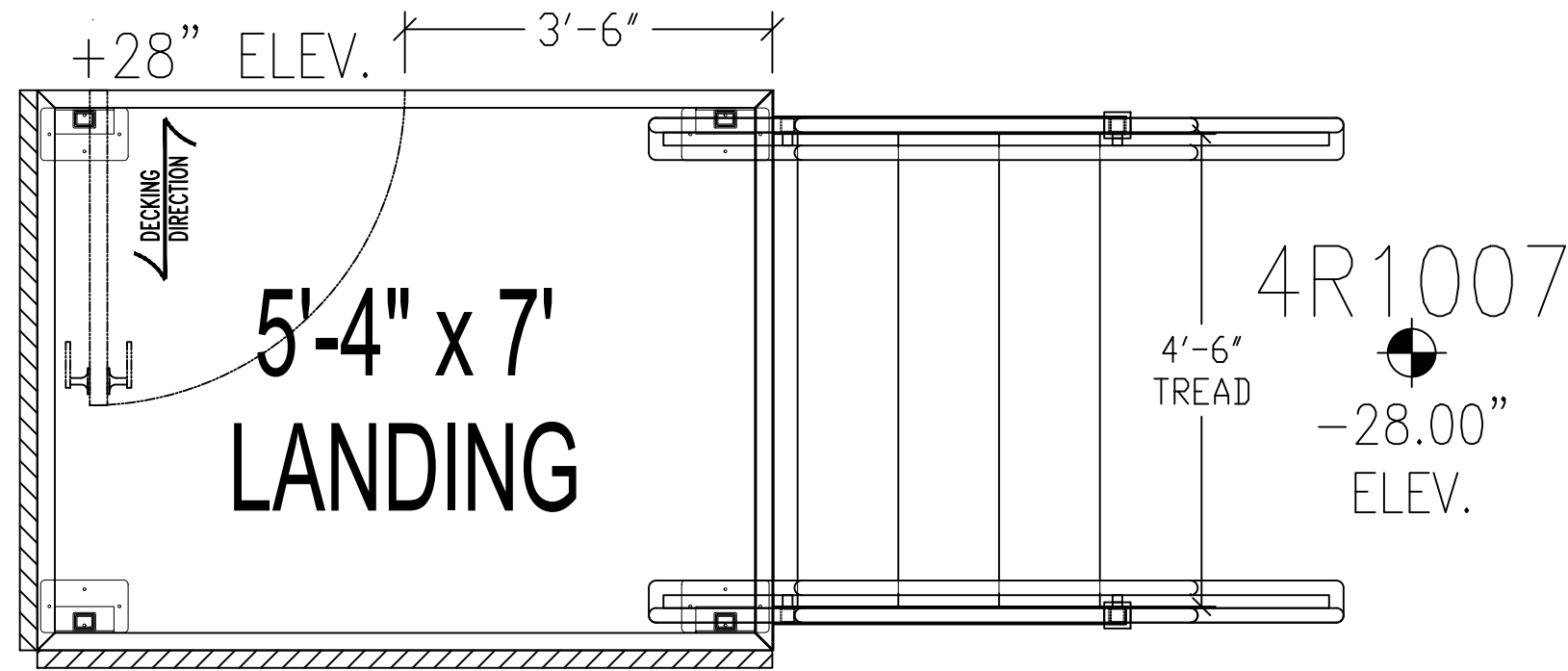
HYDRO
 125 Superior Drive
 Delhi, LA 71232
 Phone: 1(800)779-5509
 Fax: 1(866)840-4566



FOR QUOTATION
 PURPOSES ONLY

STEIN ARCHITECT, INC.
 SACRAMENTO, CA
 ALUMINUM ACCESS STAIR SYSTEM
 WITH 34" HIGH VERTICAL PICKET GUARDRAIL

DATE 1/16/2023
 JOB NO. ----
 FILENAME Stein_BD23013
 REV. R - 0
 DRAWN BY TMB
 APPROVED BY
 SHEET NUMBER COVER



34/23 VP STAIR ACCESS PLAN VIEW

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HYDRO
125 Superior Drive
Delhi, LA 71232
Phone: 1 (800) 779-5509
Fax: 1 (866) 840-4566



FOR QUOTATION
PURPOSES ONLY

STEIN ARCHITECT, INC.
SACRAMENTO, CA
ALUMINUM ACCESS STAIR SYSTEM
WITH 34" HIGH VERTICAL PICKET GUARDRAIL

DATE 1/16/2023

JOB NO. -----

FILENAME Stein_BD23013

REV. R - 0

DRAWN BY TMB

APPROVED BY

SHEET NUMBER

01

END OF SECTION 11 70 00

SECTION 26 05 00

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish and install all necessary labor, materials, tools and equipment to perform and completely finish the work according to the intent of this specification, and the accompanying drawings.
- B. Provide conduit, wires and other miscellaneous materials, equipment and devices, not specifically mentioned in other sections of Division 26, but necessary and/or required for equipment or system operation of function.
- C. Review all specification sections and drawings for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service. Refer to Section 260519 of these specifications for connection requirements.
- D. Drawings indicate design loads and voltages and corresponding control equipment, feeders, and overcurrent devices. If equipment actually furnished, other than for equipment provided by the University, have loads or voltages 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 University. Such adjustment shall be subject to the review of the University's Representative.
- E. Provide connections of all equipment specified under this section and any other section and Division 23 including installation and connection of all relays, remote starters, etc. and the connection of all motors and controllers. Control wiring for Division 23 systems shall be provided by Division 23. Review Division 23 specifications and shop drawings for control systems to assure compatibility between equipment furnished under Division 26 and wiring furnished under Division 23 and 23. Motor controllers (starters) shall be furnished and installed under Division 26, unless specified to be furnished as an integral component of the equipment or unless controller is variable frequency drive type. Provide the number and type of auxiliary contacts necessary to interlock the equipment and provide the control sequence in Division 23.

1.02 LOCAL CONDITIONS

- A. Examine site; verify dimensions and locations against drawings and become informed of all conditions under which work is to be done before submitting proposal. No allowance will be made for extra expenses because of omission on Contractor's part to include cost of work under prevailing conditions.
- B. Information shown relative to services is based upon available records and data shall be regarded as approximate only. Minor deviations found necessary to conform with actual locations and conditions shall be made without extra cost.
- C. Extreme care shall be exercised in excavating near existing utilities to avoid any damage thereto; be responsible for any damage caused by such operations.
- D. Request any utility shutdown, dig permit or road closure through the University's Representative, 14 days in advance. Include detailed procedure and proposed schedule. In each case approval must be obtained from the University's Representative for the requested shutdown time and work involved. Shutdown work shall be performed on overtime hours if so directed by the University.
- E. Protect premise and work of other trades from damage arising out of installation of work of this division. If damage has occurred, repair or replace materials and parts of premises as directed by University's Representative at no cost to the University.

1.03 CODES AND STANDARDS

- A. Applicable codes are those specified in Section 01 41 00 – Regulatory Requirements. Nothing in the Drawings or Specifications shall be construed to permit work not conforming to these codes, latest edition as adopted by authority having jurisdiction.

- B. Material Standards: All material shall be new and shall conform to the standards where such have been established for the particular material in question. Publications and Standards of the organization listed are applicable to materials specified herein. Also refer to Division of these specifications: Insulated Cable Engineers Association (ICEA), Institute of Electrical and Electronic Engineers (IEEE), Edison Electric Institute (EEI), American Wood Preservers Association (AWPA), National Board of Fire Underwriters (NBFU), Illuminating Engineering Society (IES), Electrical Testing Laboratory (ETL).
 - C. Code compliance is mandatory - no information or details on the drawings or specifications permits work not conforming to code. Where work is shown to exceed minimum code requirements perform work per drawings and specifications.
- 1.04 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.
 - B. Do not scale drawings. Obtain dimensions for layout of equipment from Architectural plans and details unless indicated on Electrical plans. Field measurements take precedence over dimensioned drawings.
 - C. Bring all discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions to the immediate attention of the University's Representative.
 - 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 with Engineer. Equipment which exceeds specified maximum dimensions or which reduces required clearances shall not be accepted.
- 1.05 RECORD DRAWINGS
- A. Upon completion of all Work, but before final acceptance, the Contractor shall furnish the University's Representative with complete sets of reproducible drawings updated and corrected to "as-built" conditions as specified. The contract documents drawings issued for bid shall be revised for "as-built" conditions. Include electronic panelboard files in Excel format updated to "as-built" conditions, copies of all submittal data, shop drawings, control Panel layout, point to point wiring diagram, conduit routing, underground duct banks, site lighting and any other detailed drawings.
 - B. All symbols, designations, and layers used in preparing Record Drawing shall match those used in Contract Drawings and electronic files.
 - C. Show all buried and concealed conduit, stub-outs, etc. Locate all buried conduit and stub-outs by dimensions from permanent, easily located and identifiable portions of structure; also, dimension ends of stub-outs, etc. Note depth of buried items below grade.
- 1.06 SUBMITTALS
- A. Shop Drawings and Product Data:
 - 1. Submit for review by the University's Representative data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive material, catalogs, cuts, diagrams, performance curves, and charts published by the manufacturer to show conformance to specification and drawing requirements; model numbers alone will not be acceptable. Provide complete electrical characteristics for all equipment. Submittals for lighting fixtures shall include Photometric data.
 - 2. Refer to the individual sections for identified equipment and materials for which submittals are required.
 - 3. Refer to Division 1 for required procedures.
 - B. Operation and Maintenance Data and Instruction:
 - 1. Refer to Division 1 for detail requirements.

2. Printed Material: Provide required printed material for binding in operation and maintenance manuals.
 3. Instructions of University Personnel:
- C. Before final inspection, as designated by the University's Representative provide a competent representative to instruct University's designated personnel in systems under this division of the specifications. For equipment requiring seasonal operation, perform instructions for other season within six months unless requested otherwise.
 - D. 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.
 - E. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials mentioned herein or on drawings require that each item listed be provided and of quality noted, or an approved equal. All material shall be new, full weight and standard in all respects and in first-class conditions. Materials and equipment shall be uniform throughout the installation. Where possible, all materials used shall be of the same brand or manufacturer throughout for each class of material or equipment.
- B. Grade or quality of materials desired is indicated by trade names or catalog numbers stated herein. Substitutions will be also be evaluated on maintenance track record and parts availability for previous installations that have been installed a minimum of five years. Refer to Specification Section 01 33 23. Dimensions, sizes and capacities shown are a minimum and shall not be changed without permission of Engineer.
- C. All electrical equipment and materials shall satisfy minimum requirements of NEMA, IEEE and ANSI standards. All materials must be UL approved, or if not covered by UL testing standards, shall be test and approved by a Nationally Recognized Testing Laboratory (NRTL).
- D. Work such as painting, patching, welding or carpentry related to the work of this Division shall be performed by the appropriate trade experienced in that work, but shall be provided for under this Division.
- E. The following systems will be purchased and installed separately by the University. Provide all the conduit and outlet boxes required for complete installation under this contract. Provide input to and coordination with the University's Representative during the preparation of the shop drawings. Review shop drawings provided by University's Representative for installation information and provide comments as required. Installation of conduit and outlet boxes shall be governed by shop drawing requirements. All special system conductors will be provided and installed by the contractor; all conductors required for 120-volt power shall be provided under this contract. Notify the University's Representative of required dates for shop drawing completion and material delivery to coordinate with overall construction schedule. Specification sections contained herein are based on a complete system - individual components to be provided by the University are not identified other than by the requirements of this paragraph.
 1. Security Cameras and camera mounts.

PART 3 - EXECUTION

3.01 ELECTRICAL SYSTEMS OPERATIONAL TESTS, MANUFACTURERS SYSTEMS CERTIFICATION AND DESIGN AUTHORITY ASSISTANCE

- A. Commissioning The project will have selected building systems commissioned. The equipment and systems to be commissioned are specified in Section 01 91 13. The commissioning process is described in Section 01 91 13.

3.02 GENERAL

- A. All electricians to be state certified and apprentices in an approved training program.
- B. When changes in location of any work are required, obtain approval of University's Representative before making changes.
 1. Make changes at no extra cost.
- C. Do not change indicated sizes without written approval of University's Representative.

- D. Provide all necessary offsets and crossovers in conduits, raceways, cabletrays and ducts.
 - E. Provide flexible connections of short length to installations or equipment subject to vibration or movement and to all motors. Provide a separate bonding conductor across all flexible connections.
 - F. Install exposed conduits parallel to walls and ceilings and vertically plumb, unless otherwise indicated.
 - G. Existing equipment or electrical wiring which is to remain, but has been removed to facilitate the installation of the new equipment, shall be restored to its original operating condition.
 - H. Where electrical items penetrate fire or smoke rated walls, ceilings and floors, comply with Section Division 7.
 - I. Before any cutting, burning, heating or other work that will emit smoke, dust or other products of combustion that may set off the fire alarm system, request a fire alarm system shutdown from the University's inspector. This request shall be made at least 14 days prior to the date the shutdown is required. If this requirement is ignored and triggers the fire alarm system the offending party shall be responsible for all false alarm charges from the fire department. Instruct all personnel of this requirement before they are permitted on the job site. If the job site has a portable fire alarm system installed for the construction period, turn the system on and off each working day.
 - J. Provide concrete foundations or pads as follows for floor mounted electrical equipment where indicated on the drawings:
 - 1. Install minimum 4" high concrete pads or as indicated. Other pad dimensions shall be as required to accommodate the equipment installed.
 - 2. Use 3,000 PSI (14 Kg/s/mm) concrete.
 - 3. Reinforce with 6" x 6" W2.9 x W2.9, 10GA (3.4mm) mesh, with short dowels into floor at 12" OC around perimeter.
 - 4. Chamfer top edges 3/4" (18mm).
 - 5. Make all faces smooth.
 - 6. Set anchor bolts for equipment. Consult with user.
 - 7. Coordinate the size of all pads, the location of all anchor bolts, and the location of all vibration isolators.
- 3.03 QUALITY ASSURANCE AND PROJECT SAFETY
- A. Provide quality assurance and project safety programs. Satisfy the minimum acceptable requirements provided in the specifications.
- 3.04 PREPARATION
- A. Examine Drawings and Site; be familiar with types of construction where electrical installation is involved.
 - 1. Work shall be neatly installed in a professional manner in accordance with NECA Standard of Installation. Work shall be coordinated with other trades to avoid conflicts. Clarifications will be made by University's Representative and minor adjustments shall be made without additional cost to University. Obtain clarification from University's Representative concerning any obvious discrepancies or omissions in work before bidding. All work involved in correcting obvious errors or omissions after award of Contract shall be performed as directed by University's Representative without additional cost to University.
 - B. Layouts of equipment, accessories and wiring systems are diagrammatic (not pictorial), but shall be followed as closely as possible. Drawings and Specifications are for assistance and guidance, and exact locations, distances, levels, etc., will be governed by Site.
 - C. Schedule of Values:
 - 1. Refer to Division 1 for submittal requirements.
 - 2. Provide a schedule of values for the electrical work specified under Division 26. Include separate labor and material itemization for each line item requested. The itemized schedule of values will be used to determine project completion and progress for payment requests, including overhead and profit for each

itemization. Schedule of values must be submitted and approved prior to first pay request. Provide the following line items as a minimum level of itemization:

- D. Electrical service and distribution (include all power equipment, i.e., panelboards, transformers, feeders, motor controllers, etc.).
- E. Lighting systems (include all fixtures, lamps, branch circuiting, and lighting controls).
- F. Devices (include all power outlets and branch circuit wiring not associated with lighting, motors, or equipment connections).
- G. Equipment connections (include all wiring and connection to HVAC, elevators, etc., including controlling devices and feeders).
- H. Basic work and materials (include work common to all systems, i.e., backboards, cutting and patching, demolition, temporary services, record drawings, permits, etc.).
- I. Special systems (itemize separately, including emergency power supply system, grounding system, UPS equipment, etc.).
- J. Communications/signaling systems (include all low voltage systems, itemized separately, i.e., fire alarm, sound paging, security, etc.).

3.05 WORKING SPACE

- A. Provide adequate working space around electrical equipment in compliance with Article 4 of Electrical Safety Orders. In general, provide 36" minimum clear workspace in front of panelboards and controls.
 - 1. 36" @ 250V and less.
 - 2. 42" @ 250V to 600V.

3.06 PRODUCT DELIVERY, STORAGE, HANDLING, AND PROTECTION

- A. Inspect materials upon arrival at Project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material including University furnished material. Handle materials in accordance with manufacturer's applicable standards and suppliers recommendations, and in a manner to prevent damage to materials. Store packed materials in original undamaged condition with manufacturer's labels and seals intact. Containers which are broken, opened, damaged, or watermarked are unacceptable and shall be removed from the premises and replaced at no additional cost to the University.
- B. All material, except items specifically designed to be installed outdoors, shall be stored in an enclosed, dry building or trailer. Areas for general storage shall be provided. Provide temperature and humidity control where applicable. No material for interior installation, including conductors, shall be stored other than in an enclosed weathertight structure. Equipment stored other than as specified above shall be removed from the premises and replaced at no additional cost to the University.
- C. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the equipment or materials are designed to be installed. Equipment and materials shall be protected from water, direct sunlight, cold or heat. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced at no additional cost to the University.

3.07 CARE AND CLEANING

- A. Remove oil, dirt, grease and foreign materials from all raceways, fittings, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trim, motor control center, switchboard or equipment enclosures with paint furnished by the equipment manufacturers specifically for that purpose.
- B. Accessible elements of disconnecting and protective devices of equipment, coils of dry type transformers and the like shall be cleaned with compressed air (less than 15 PSI) and the enclosures vacuum cleaned prior to being energized.
- C. Clean light fixtures and lamps thoroughly, just prior to final inspection. Fixture enclosures, shielding, etc., shall be cleaned by an approved method.
- D. Do not paint trim covers for flush mounted panelboards, telephone cabinets, pull boxes, junction boxes and control cabinets unless required by the University's Representative.

Remove trim covers before painting. Under no conditions shall locks or exposed trim clamps be painted.

- E. Unless indicated on the drawings or specified herein to the contrary, all painting shall be done under the PAINTING Section of these Specifications.
- F. Where plywood backboards are used to mount electrical equipment provided under Division 26, paint backboards with two coats of light gray semi-gloss fire retardant paint under Division 26.
- G. Plywood, Mounting Backboard for Communications Equipment - Plywood mounting backboard shall extend ceiling-to-floor (10'), unless otherwise specified. Mount plywood to cover the entire area on which connecting hardware and cable management hardware may be mounted. Mounting board shall be AC-grade or better, void-free plywood, with a minimum thickness of 19 mm ($\frac{3}{4}$ "⁴).
 - 1. Two-coats of FR-S fire-retardant rated paint shall be applied to all exposed surfaces. The plywood-rating stamp shall be left exposed for inspection purposes.
 - 2. Securely fasten plywood to wall-framing members. Use flush hardware and supports to mount plywood.
 - 3. Ensure that the strength and placement of the hardware are sufficient to handle the total anticipated load (static and dynamic) and mounting of cabling components.
- 4 Color of paint shall be **WHITE**.
- H. All broken, damaged or otherwise defective parts shall be repaired or replaced without additional cost to the University. Work shall be left in a condition satisfactory to University's Representative. At completion, carefully clean and adjust all equipment, fixtures and trim installed as part of this work. Systems and equipment shall be left in a satisfactory operating condition.
- I. All surplus materials and debris resulting from this work shall be periodically cleaned out and removed from site; this includes surplus excavated material.

3.08 EXCAVATING AND BACKFILLING

- A. Excavate and backfill as required for installation of electrical work. Restore all surfaces, roadways, sod, walks, curbs, walls, existing underground installation, etc., cut by installations to original condition in an acceptable manner. Maintain all warning signs, barricades, flares and lanterns as required by the Safety Orders and local ordinances.
- B. Excavation: Dig trenches straight and true to line and grade, with bottom clear of any rock points. Support conduit for entire length on undisturbed original earth. Minimum conduit depth of crown shall be 2' below finished grade.
- C. Backfill: All backfill material shall be local material free of rubble, rubbish or vegetation. Trenches shall be backfilled and compacted to 90% of maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.

3.09 CUTTING AND PATCHING

- A. Provide necessary cutting and patching required to accomplish the work of Division 26.
- B. Do not endanger the stability of the structure by cutting, drilling or otherwise modifying the structural members of the building. Direct all requests for structural modifications to the University's Representative for approval. Proceed with these modifications only as directed by the University's Representative.
- C. Cutting and patching requirements will be modified only if General Construction Specifications and drawings specifically state that certain portions or all cutting and patching required for each of the various trades is to be performed.
- D. Refer to General Construction Specifications for execution and requirements for patching and painting and comply with applicable provisions as to materials and quality of installation.

3.10 PROTECTION

- A. In performance of work, protect work from damage. Protect electrical equipment, stored and installed, from dust, water or other damage.

3.11 EQUIPMENT IDENTIFICATION

- A. Panelboards, remote control switches, terminal boxes, etc., shall be properly identified according to section 260553 of these specifications.
- 3.12 RUST INHIBITER
 - A. Channels, joiners, hangers, caps, nuts and bolts and associated parts shall be plated electrolytically with zinc followed immediately thereafter by treating freshly deposited zinc surfaces with chromic acid to obtain a surface which will not form a white deposit on surface for an average of one hundred twenty (120) hours when subjected to a standard salt spray cabinet test, or shall be hot dipped galvanized.
- 3.13 ELECTRICAL SYSTEMS OPERATIONAL TESTS, MANUFACTURERS SYSTEMS CERTIFICATION AND DESIGN AUTHORITY ASSISTANCE
 - A. Testing:
 - 1. Provide tests specified in other sections. Test all wiring and connections for continuity and grounds; where such test indicate faulty insulation or other defects, locate, repair and retest. Balance loads at panelboards. Furnish all testing equipment.
 - 2. Refer to the individual specification sections and Section 26960 26 90 90 of the specifications for test requirements.
 - 3. Prior to the final inspection, the systems or equipment shall be tested and reported as therein specified. Five (5) typewritten copies of the tests shall be submitted to the University's Representative for approval. Testing does not replace the requirement for final inspection of the project work.
 - 4. All electrical systems shall be tested for compliance with the specifications.
 - B. Manufacturers Certifications:
 - 1. The electrical systems specified herein shall be reviewed for compliance with these specifications, installation in accordance with the manufacturers' recommendations and system operation by a representative of the manufacturer. The manufacturer shall submit certification that the system has been reviewed by the manufacturer, is installed in accordance with the manufacturer's recommendations and is operating in accordance with the specifications.
 - 2. Provide manufacturers certification for the following systems:
 - C. Fire Alarm System
 - D. Lighting Control Systems
 - 1. Design Authority Assistance:
 - E. Remove equipment covers (i.e. panelboard trims, motor controls, device plates, and junction box covers) as directed for inspection of internal wiring. Accessible ceilings shall be removed as directed for inspection of equipment installed above ceilings.
 - F. Energize and de-energize circuits and equipment as directed. Demonstrate operation of equipment and systems as directed by the University's Representative.
 - G. Provide authorized representatives of the manufacturers to demonstrate to the University's Representative compliance with the specifications of their respective system during or prior to the final inspection at a time designated by the University's Representative. Refer to the specific specification section for additional testing requirements. Representatives of the following systems are required for demonstrations:
 - 1) Fire Alarm System
 - 2) Lighting Control System
- 3.14 CLOSING OF AN UNINSPECTED WORK
 - A. Do not allow or cause any of work installed hereunder to be covered up or enclosed before it has been inspected and approved.
 - B. Should any work be enclosed or covered up before it has been approved, uncover such work and after it has been inspected and approved, make all repairs necessary to restore work of others to conditions in which it was found at time of cutting, all without additional cost to the University.
- 3.15 TEMPORARY FACILITIES
 - A. Provide temporary shop office and storage space on site only at locations approved by the University's Representative. Remove these facilities upon completion of work.
- 3.16 NOISE AND VIBRATION

- A. Cooperate in reducing objectionable noise or vibration. If noise or vibration occurs as a result of the use of improper material or installation, correct these conditions at no cost to the University.

END OF SECTION 26 05 00

SECTION 26 05 19
LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work required under this section of the specifications consists of furnishing, installing and connecting the building wiring system, 600 volts and below. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. Wiring systems for communication and alarm systems are not included in this section unless specified to be included, by reference, in the respective specification sections for alarm and communication systems.

1.02 RELATED WORK

Section 260533 – Raceways
Section 260520 – Electrical Connections for Equipment

1.03 QUALITY ASSURANCE

- A. Industry Reference Standards. The following specifications and standards are incorporated into and become a part of this Specification by Reference.
1. Underwriters' Laboratories, Inc. (UL) Publications:
 - a. No. 83 Thermoplastic - Insulated Wires
 - b. No. 486 Wire Connectors and Soldering Lugs
 - c. No. 493 Thermoplastic - Insulated Underground Feeder and Branch Circuit Cables
 - d. No. 854 Service Entrance Cables
 2. Insulated Cable Engineers Association Standards (ICEA):
 - a. S-61-402 Thermoplastic Insulated Wire and Cable
 3. National Electrical Manufacturer's Standards (NEMA):
 - a. WC-5 Thermoplastic Insulated Wire and Cable
 - b. WC-26 Wire and Cable Packaging
 4. UBC Standard 4-1 for non-combustible materials for wires and cables above non-sprinklered ceilings.
 - a. Acceptable Manufacturers: Products produced by the following manufacturers which conform to this specification are acceptable.

5. Hydraulically applied conductor terminations:
 - a. Scotch (3M)
 - b. Thomas and Betts (T&B)
 - c. or equal
6. Mechanically applied (crimp) conductor terminations:
 - a. Scotch (3M)
 - b. Thomas and Betts (T&B)
 - c. or equal
7. Vinyl electrical insulating tape:
 - a. Scotch (3M)
 - b. Tomic
 - c. or equal
8. Twist-On Wire Connectors:
 - a. Buchanan
 - b. Ideal
 - c. or equal
9. Encapsulated insulating kits:
 - a. Essex Group, Inc.
 - b. Raychem
 - c. Scotch (3M)
 - d. or equal
10. Portable cable fittings:
 - a. Crouse Hinds
 - b. T & B
 - c. or equal
11. Insulated cable:
 - a. Pirelli Cable Corp.

- b. Southwire Co.
- c. or equal

- B. Performance: Conductors shall be electrically continuous and free from short circuits or grounds. All open, shorted or grounded conductors and any other damaged insulation shall be removed and replaced with new material free from defects.
- C. Delivery, Storage and Handling: Deliver wire and cable in accordance with NEMA WC-26. Wires and cables shall not be stored in an exterior or unprotected location. Material subject to direct exposure to the elements shall be replaced and removed from the project. Bring wire to job in original unbroken packages. Obtain approval of University's Representative before installation of wires.

1.04 SUBMITTALS

- A. Submit shop drawings in accordance with the Conditions of the Contract and Division One Specifications Sections for the conductors, terminations, connectors, insulating tape, and insulating kits.
- B. Submit field test reports indicating and interpreting test results required by the "Electrical Equipment Acceptance Testing" section of these specifications.

PART 2 - PRODUCTS

2.01 GENERAL MATERIALS REQUIREMENTS

- A. Provide all materials under this section of the specifications.
- B. All wire and cable shall be UL listed and shall bear a UL label along the conductor length at intervals not exceeding 24 inches.
- C. All conductors shall have size, grade of insulation, voltage and manufacturer's name permanently marked on the outer cover at intervals not exceeding 24 inches.
- D. 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.
- E. Insulation voltage level rating shall be 600 volts.
- F. All conduit and conductor sizes indicated on the drawings are based upon copper conductors. 60C ampacities shall be used for sizing of all wire and cable for branch circuits and feeders rated below 125 amps. 75C ampacities shall be used for sizing of all wire and cables for feeders rated 125 amps and above.
- G. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

2.02 PRODUCT/MATERIALS DESCRIPTION - CONDUCTORS

- A. Conductors shall be stranded copper, 90°C, type THHN/THWN or XHHW unless otherwise indicated on the drawings, required by the California Electrical Code, or specified herein.
- B. Fixture wire shall be No. 16 AWG silicone rubber insulated, stranded fixture wire, type SFF-2 (150°C), or No. 16 AWG thermoplastic, nylon jacketed stranded fixture wire, type TFFN (90°C). Color code as specified herein shall not be required for fixture wire; however, neutral conductor shall be identified distinctly from phase conductors.

- C. Control conductors for use on 120 volt control wiring systems shall be No. 12 AWG stranded type THHN/THWN, where properly protected, unless indicated otherwise on the drawings. Switch legs are not considered control wiring.
- D. Wire shall be 1991 Code type copper wire of not less than 98% conductivity. All wires shall be stranded. Wires shall bear the Underwriters' label, be color coded and be marked with gauge, type and manufacturer's name on 24" centers.

2.03 SPLICES, TAPS, AND CONNECTORS

- A. Splices, taps and connectors (No. 10 AWG and smaller) - Splices and joints shall be twisted together electrically and mechanically strong and insulated with approved type insulated electrical spring connectors.
- B. Splices, taps and connectors (No. 8 and larger) - Joints and connections shall be made with Burndy, T & B, or equal, solderless tool applied pressure lugs and connectors. Uninsulated lugs and wire ends shall be insulated with layers of plastic tape equal to insulation of wire and with all irregular surfaces properly padded with "Scotchfil", 2nd product or equal putty prior to application of tape. Tape shall be equal to Scotch #33, General Electric #AW-1, or equal. Feeder splicing, where permitted, shall be made with high compression sleeve type connector followed by manufactured splicing kit utilizing as insulators, resins poured into a ready-to-use plastic mold to provide a uniform, moisture-proof tough, impact-resistant insulation. Hydraulically applied crimping sleeve or tap connector sized for the conductor. Insulate the hydraulically applied connector with 90°C, 600 volt insulating cover provided by the connector manufacturer. Insulator materials and installation shall be approved for the specific application, location, voltage and temperature and shall not have an insulation value less than the conductor being joined.
- C. Electrical insulating tape shall be 600 volt, flame retardant, cold and weather resistant, minimally .85 mil thick plastic vinyl material; Scotch No. 88, Tomic No. 85, Permacel No. 295, or equal.

PART 3 - EXECUTION

3.01 EXECUTION

- A. Install all wiring in raceway system, except where conductors are indicated or specified not to be installed in raceway. Any conductors found to be damaged or defective, including insulation damaged during installation, shall be removed and replaced at no expense to the University.
 - 1. Pull conductors into raceway simultaneously where more than one is being installed in the same raceway.
 - 2. Use UL listed pulling compound or lubricant where necessary to reduce cable pulling tension below the manufacturer's recommended levels. Compound used shall not deteriorate conductor or insulation.
 - 3. Use pulling means, including fish tape, cable rope, or basket-weave wire/cable grips that will not damage cable or raceway.
- B. Connect all conductors. Torque each terminal connection to the manufacturers recommended torque value. A calibrated torquing tool shall be used to insure proper torque application.

- C. 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.
- D. Conductors shall be tested to be continuous and free of short circuits and grounds.
- E. Maintain phase rotation established at service equipment throughout entire project.
- F. Group and lace with waxed linen lacing cord (T & B "Ty-Rap", Holub "Quik-Wrap" or equal) all conductors within all enclosures, i.e., panels, motor controllers, equipment cabinets, switchboards, etc.
- G. Splices in homerun conductors to panelboards, motor control enclosures, and other panels shall be kept to the minimum practicable and shall only be made as necessary to support pulling of the conductors. Make splices in conductors only within junction boxes, wiring troughs and other enclosures as permitted by the California Electrical Code. Do not splice conductors in pull boxes, panelboards, safety switches, switchboard, switchgear, motor control center, or motor control enclosures.
- H. Splices in conductors installed below grades are not permitted, unless approved in writing by the University's Representative. For taps indicated on the drawings and approved splices below grades, connections shall be made in flush mounted watertight junction box with crimp connectors and watertight resin encapsulating insulating kit. Service entrance conductors shall not be spliced.
- I. Support conductors installed in vertical raceways at intervals not exceeding those distances indicated in the California Electrical Code. Support conductors in pull boxes with bakelite wedge type supports or "Kellem" grips or equal, provided for the size and number of conductors in the raceway. Do not splice conductors in pull boxes used for vertical cable supports unless written permission for splicing is obtained. Where splicing is permitted, make splice with hydraulically applied splicing sleeve.
- J. Terminate conductors No. 10 AWG and smaller specified in Division 26 to be stranded, with crimp type lug or stud. Direct termination of stranded conductors without crimp terminator to terminal screws, lugs, or other points is not permitted even if terminal is rated for stranded conductors. Crimp terminal shall be the configuration type suitable for terminal point.
- K. Make connections between fixture junction box and fixture with fixture wire.
- L. Control, communications or signal conductors shall be installed in separate raceway systems from branch circuit or feeder raceway, unless indicated otherwise on the drawings.
- M. Conductor lengths for parallel circuits shall be equal. Do not configure isolated phasing in separate conduits for parallel conductors.
- N. Install a minimum of twelve inches (300 mm) of slack conductor at each outlet.
- O. Thoroughly clean conductors prior to installing lugs and connectors.

- P. Secure portable cables in accordance with the CEC. Install strain relief devices to prevent tension on terminations if cable is pulled. Install cable grips on drops and connect to outlet box or structure. Leave slack cable loop at drop point.

3.02 IDENTIFICATION

A. Color Code Conductors:

1. Color code all secondary service, feeder and branch circuit conductors. Control and signal system conductors need not be color coded.
2. Coding shall be as follows:
 - a. 208Y/120 volt three phase four wire wye system - Phase A: Black, Phase B: Red, Phase C: Blue, Neutral: White, Travellers: Orange.
 - b. 480Y/277 volt three phase four wire system - Phase A: Brown, Phase B: Violet, Phase C: Yellow, Neutral: Gray, Travellers: Pink.
 - c. Grounding conductors shall be green. Grounding conductors for isolated ground circuits shall be green with a yellow trace.
3. Phase conductors No. 10 and smaller shall have solid color compound insulation or color coating. Phase conductors No. 8 and larger shall have solid color compound, color coating or colored phase tape. Colored tape shall be installed on conductors in every box, at each terminal point, cabinet, through manhole or other enclosure.
4. Conductors within pull boxes shall be grouped and identified with nylon tie straps with circuit identification tag.
5. Identify each control conductor at its terminal points with wrap around tape wire markers. I.D. to indicate terminal block and point designation, or other appropriate identifying indication.
6. Refer to ELECTRICAL IDENTIFICATION section of these specifications for additional identification requirements.

3.03 TESTING

- A. Refer to Electrical Equipment Acceptance Testing section of this specification for testing requirements.

END OF SECTION 26 05 19

SECTION 26 05 20
ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART I - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Electrical Connections to equipment specified under other sections or as shown on drawings.

1.02 SUBMITTALS

- A. None Required.

1.03 REFERENCE STANDARDS.

- A. Underwriters Laboratories.
- B. NEMA WD5 – Specific Purpose Wiring Devices.

1.04 QUALITY ASSURANCE

- A. Field verify equipment rating with manufacturers nameplate data. Adjust feeders and overcurrent protectors as required to comply with code requirements.

PART II - PRODUCTS

2.01 LUGS

- A. Acceptable Manufacturers.
 - 1. Burndy Corporation.
 - 2. ILSCO Corp.
 - 3. Or Equal
- B. Compression Type: Seamless, one piece, copper, size per conductor applied to, two NEMA Drill.
- C. Set Screw Type: Pin type compression fittings for use on #2 AWG and larger conductor sizes, barrels filled with conductive paste.

2.02 CRIMP ON TERMINALS

- A. Acceptable Manufacturers
 - 1. Thomas-Betts
 - 2. 3M
 - 3. Or Equal

- B. Crimp on, insulated terminals for use on #14 AWG thru #10 AWG conductor size, flanged fork or ring torque style.

2.03 CONNECTORS, SPLICES AND TAPS

- A. Acceptable Manufacturers
 - 1. Burndy
 - 2. ILSCO
 - 3. Or Equal
- B. Compression or set screw type with insulating cover for use on #8 AWG and larger conductor.
- C. Split bolt connectors with insulating covers for use on #6 AWG and larger conductor.

2.04 WIRE CONNECTORS

- A. Acceptable Manufacturers
 - 1. Ideal Industries
 - 2. Buchanan
 - 3. Or Equal
- B. Conical spring type with nylon or plastic outer shell, color coded to denote wire size, for use on #14 AWG thru #10 AWG conductors.
- C. Butt Compression style insulating crimp splices for use on #14 AWG and smaller conductors.

PART III - EXECUTION

3.01 INSTALLATION

- A. Bus Connection: Use compression lugs, bolt to bus bars using cap screws, lock washers and nuts of material electrically compatible with bus.
- B. Set Screw Connection: Install pin type compression fitting of similar construction as compression lugs.
- C. Terminations to Motors: Use crimp on connectors for motor terminations from stranded conductors and where terminal lugs are not provided by equipment supplier. Use ring-tongue terminals where ever possible.
- D. Use connector manufacturer approved crimping tool to install connectors. Do not remove conducting strands or oversize connector. Apply insulating tape over exposed conductor to 150% of conductor insulating material.
- E. Tighten connections to ensure maximum surface contact between terminals.
- F. Strip insulation per manufacturers instructions, use conductive paste where required.

- G. Install electrical connections as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices.
- H. Coordinate with other work, including wires, cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
- I. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- J. Fasten identification markers to each electrical power supply conductor which indicates their voltage, phase and feeder number in accordance with Electrical Identification section. Affix markers on each terminal conductor, as close as possible to the point of connection.

3.02 INSPECTION

- A. Inspect area and conditions under which electrical connections for equipment are to be installed. Do not proceed with the work until conditions are acceptable for terminations.

3.03 FIELD QUALITY CONTROL

- A. Upon completion of installing of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirements. Correct malfunctioning units at site, then retest to demonstrate compliance.
- B. Test all wiring and connections for continuity and grounds; where such test indicate faulty insulation or other defects, locate, repair and retest. Balance loads at panelboards. Furnish all testing equipment.
- C. Provide documentation of all tests as specified by this and other sections in the following formats. Submit in an electronic form (2 copies) and in hard paper form (2 copies). Submit interim test reports to the University's Representative and 'final' acceptance test reports (where only one test iteration is required consider it be the 'final') to the prime electrical contractor (for a single, consolidated submission of all electrical test and O&M's to the University). Compile the electronic copies (including graphics or drawings) entirely in the current version of Acrobat Abode complete with an interactive field linked Table of Contents (linked to the chapters and subsections within the report). Submit electronic copies on a CD (or CD's).
- D. All electrical systems testing (power and low voltage) as described by each central collection point for all test documentation, whether the tested systems were provided and installed under his contract or not. All Division 16 contractors and vendors are required to cooperate with the prime electrical contractor in this regard and the single submission of tested results shall be considered a contract requirement of all contractors and vendors for all electrical, communication, data, etc. work performed under Division 16.
- E. Provide a copy of the test documentation with the O&M Manual submission.

END OF SECTION 26 05 20

SECTION 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART I - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Power System Grounding.
 - 2. Communications System Grounding.
 - 3. Electrical Equipment and Raceway Grounding and bonding.

1.02 SUBMITTALS

- A. Submit a complete set of marked-up record drawings to indicate installed location of system grounding electrode connections, and routing of grounding electrode conductor.
- B. Submit certified test results stating ground resistance from service neutral at service entrance.

1.03 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association (NEMA).
- B. American National Standards Institute (ANSI).

PART II - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Erico
- B. Oz Gedney.
- C. or equal

2.02 MATERIALS

- A. Ground Rods: Copper encased steel 1" diameter, minimum length – 10'.
- B. Ground Clamp: Water pipe connection, bronze two-piece with serrated jaws, lug sized for grounding electrode conductor.
- C. Connectors, Compression Type: Bronze or Copper, pretreated with conductive paste, sized for conductor to which applied.
- D. Connectors, Exothermic Weld Type: Powder actuated weld. Bond made through exothermic reaction producing molten copper from premixed copper oxide and aluminum powder. Form bond in mold or crucible.

2.03 SECONDARY GROUNDING SYSTEM

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PERMIT PACKAGE #2: GENERAL CONSTRUCTION

- A. The main grounding system shall consist of bare copper ground wires connected to a UFER ground placed below the bottom of the structural slab. The grounding system shall include, but is not limited to ground cables, fittings, connectors and all other devices and material as required to render the system complete and meet the requirements of CEC Article 250. Connect grounding system to all building columns.
- B. Except where specifically indicated otherwise, all exposed noncurrent carrying metallic parts of electrical equipment, metallic raceways systems, grounding conductor in nonmetallic raceways and neutral conductor of the wiring system shall be grounded. The ground connection shall be made at the main service equipment of each service and shall be extended to all required components of CEC Article 250.

2.04 GENERAL BRANCH CIRCUITS GROUNDING

- A. All grounding conductor wire shall be insulated green copper conductors.
- B. All conduit bushings shall be grounding type.
- C. All grounding connections shall be made with solderless lugs and nonferrous hardware.

2.05 CONDUIT BANK GROUNDING

- A. Provide a size 4 /0 bare copper grounding conductor for each of the campus utility distribution conduit banks shown on drawings. Install this grounding conductor within the ground floor slab and parallel to the respective conduit bank.

PART III - EXECUTION**3.01 GENERAL BRANCH CIRCUITS AND FEEDERS**

- A. All conduit systems, equipment housings, material housings, junction boxes, cabinets, motors, ducts, wireways, cable trays, light fixtures, portable equipment and all other conductive surfaces shall be solidly grounded in accordance with the California Electrical Code to form a continuous, permanent and effective grounding system.
- B. Install a separate green grounding conductor in all conduits, including feeder, branch circuit, and flexible; both metallic and non-metallic. The conduit systems shall not be relied upon as the system equipment grounds. Size all grounding conductors per CEC 250 unless a larger ground is indicated on the drawings. Secure grounding conductors using approved methods to each pull box, junction box, and equipment housing.
- C. All panelboards, junction boxes, pullboxes, wireways and equipment enclosures shall be bonded to the conduit systems.
- D. All building expansion joints shall be bonded.
- E. Isolated ground receptacles shall have both an isolated ground conductor and a separate equipment grounding conductor.

3.02 MOTOR CIRCUITS

- A. All motor circuits shall have a ground wire pulled with the phase conductors. The ground wire shall be extended from the panel ground bus and shall be bonded at all junction boxes, pullboxes, disconnect switches, controllers, motor connection boxes, and motor

frames. Each motor with a Variable Frequency Drive controller shall have a dedicated grounding conductor. Ground these motors back through the VFD controller as recommended by the drive manufacturer to eliminate radio frequency interference. Also, the wiring between the VFD controller and the motor shall be in a dedicated conduit.

3.03 SEPARATELY DERIVED SOURCES

- A. All secondary neutrals for the 120/208-volt wye services of dry type transformers and UPS equipment shall be grounded to building steel. Connection shall be made with cable sized according to Table 250.102(C)(1) of the California Electrical Code. Extend separately derived insulated ground to the transformer in rigid steel conduit.

3.04 EQUIPMENT ROOM GROUND TERMINAL BAR

- A. Mount bar by anchors and bolts using 1-½" long segments of ½" rigid conduit as spacer between bar and wall. Use a minimum of two supports, 18" on center. Connect all grounding electrode system conductors, system enclosure ground bus, and other indicated electrode systems to the terminal bar. Each telecom/his room shall have a ground bar with a minimum of six lugs or screws. Interconnect telecom/his ground bars to building steel with No. 6 AWG insulated copper conductor.

3.05 FLEXIBLE RACEWAY GROUNDING

- A. Install a ground conductor inside all flexible raceways (e.g. flexible steel, liquid tight). Bond the conductor to the enclosure or ground bus in the nearest box or access on either side of the flexible section. Size conductor as specified, indicated or required by code, whichever is larger.

3.06 SECTIONAL RACEWAY

- A. Install a ground conductor in all sectional raceways with removable covers for access (e.g., plug-in strips, surface raceways systems, and wireways). Size conductor in accordance with the CEC for the largest phase conductor size installed in raceway, or as indicated. Bond all sections of the raceway to the ground conductor. Connect all receptacle ground terminals in the raceway to the ground conductor, and make other ground connections indicated. This also includes all sectional raceways installed in or on University provided furniture. All surface metal raceways shall be UL listed as an equipment grounding conductor.

3.07 GENERAL GROUNDING REQUIREMENTS

- A. All ground connectors shall be bronze of the clamp type. All clamp accessories such as bolts, nuts, and washers shall also bronze to assure a permanent corrosion-resistant assembly. Connector shall be as manufactured by Burndy Engineering Company, IlSCO Corporation, or equal. Make connections easily accessible for inspection, underground or concealed in floors or walls.
- B. All ground cable splices, joints, and connections to ground rods shall be made with an exothermic welding process which shall provide a weld with current-carrying capacity not less than that of the conductors welded. Soldered connections shall not be used.
- C. All ground wire shall be insulated, unless otherwise indicated on the Drawings, extra flexible stranded copper cables. Grounding cables installed in earth shall be laid slack.

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PERMIT PACKAGE #2: GENERAL CONSTRUCTION

- D. Lighting and power panelboards shall be grounded by connecting a grounding conductor to the grounding stud and to the incoming and outgoing feeder conduits grounding bushings. Each grounding-type bushing shall have the maximum ground wire accommodation available in standard manufacturer for the particular conduit size. Connection to the bushing shall be with wire of this maximum size.

- E. The equipment for the fire protection alarm system shall have its grounding terminal connected to the ground lug on the panelboard serving the system by means of a #6 green coded insulated conductor, run in 3/4" steel conduit, utilizing a ground clamp.

END OF SECTION 26 05 26

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART I - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Conduit and equipment supports.
 - 2. Fastening hardware.
 - 3. Vibration Isolation.

1.02 SUBMITTALS

- A. Submit for each isolator, complete manufacturer's description including quantity loading and static deflection.

1.03 REFERENCE STANDARDS

- A. American Plywood Association. (APA)
- B. Underwriters Laboratories. (UL) "Building Materials Directory".

1.04 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART II - PRODUCTS

2.01 SUPPORT CHANNELS

- A. Acceptable Manufacturers – Support Channels
 - 1. Unistrut
 - 2. Super Strut
 - 3. Or Equal
- B. Support Channel: 12-gauge galvanized or painted steel, "U" section, 1-½" square nominal in section.
- C. Hardware: Manufacturer's standard as required to support equipment. Provide corrosion resistant finish.

2.02 CONDUIT SUPPORTS

- A. Conduit clamps, straps, and supports shall be steel or malleable iron for all exposed individual conduit runs. Clip type hangers may be used in concealed areas on individual

conduit runs. Group mounted, exposed or concealed shall be supported by trapeze hangers constructed of formed steel channels and threaded rods.

2.03 VIBRATION ISOLATION

- A. Provide vibration isolation in all supporting hardware for vibrating electrical equipment, (e.g., transformers). Isolators shall be as recommended by manufacturer to maximize their effect. Isolators shall be as manufactured by Mason Industries, or equal.

PART III - EXECUTION

3.01 INSTALLATION

- A. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using bolts, beam clamps, and spring steel clips.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, other conduit, or roof deck.
- D. Install all support devices according to manufacturers guidelines and recommendations.
- E. Do not drill through structural framing members.
- F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- G. Install freestanding electrical equipment on concrete pads four inches high and overlapping equipment footprint by two inches on all sides.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall, or on $\frac{3}{4}$ " plywood backboards.
- I. Install plywood backboards over gypsum board or directly to stud framing as indicated. Fasten to studs with self-tapping screws according to APA recommendations.
- J. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls with #10 S.M.S. at 12" o.c., 4 minimum, typical unless otherwise noted.
- K. Do not support equipment or fixtures from the roof deck. Provide necessary framing and joist hangers to span between structural members to locate hangers properly.
- L. Do not exceed a maximum point load of 100 lbs. to any member. Locate point loads at least 4' from any other point load on the same member.
- M. All equipment shall be installed in full compliance with all applicable seismic requirements of Title 24, Part 2, CBC.

END OF SECTION 26 05 29

SECTION 26 05 33 RACEWAYS

PART I - GENERAL

1.01 DESCRIPTION

- A. This section covers the complete interior and exterior raceway system.
- B. Definition: The term conduit, as used in this Specification, shall mean any or all of the raceway types specified.

1.02 QUALITY ASSURANCE

- A. Referenced Industry Standard: The following specifications and standards are incorporated into and become a part of this Specification by reference.
 - 1. Underwriters' Laboratories, Inc. (UL) Publications:
 - a. No. 1 Flexible Metal Electrical Conduit
 - b. No. 1242 Rigid Galvanized Conduit
 - c. No. 467 Electrical Grounding and Bonding
 - d. No. 651 Rigid Nonmetallic Electrical Conduit
 - e. No. 797 Electrical Metallic Tubing
 - f. No. 1242 Intermediate Metal Conduit
 - 2. American National Standards Institute (ANSI):
 - a. C-80.1 Rigid Galvanized Conduit
 - b. C-80.3 Electrical Metallic Tubing
- B. Acceptable Manufacturers: Products of the following manufacturers, which comply with these specifications, are acceptable.
 - 1. Metallic Conduit Fittings:
 - a. RACO
 - b. Thomas and Betts
 - c. or equal
 - 2. Support Channel:
 - a. Powers
 - b. Unistrut

- c. or equal
 - 3. Non-Metallic Conduit and Fittings:
 - a. Carlon
 - b. Thomas and Betts
 - c. or equal
 - 4. Fiberglass Reinforced Epoxy Conduit Systems:
 - a. FRE Conduit, Inc.
 - b. United Fiberglass
 - c. or equal
- C. Coordination
 - 1. Coordinate conduit installation with electrical equipment furnished.
 - 2. Coordinate conduit installation with contract documents. Adjust installation to eliminate conflicts. Review all shop drawings submitted under this and other sections to insure coordination with all equipment requiring electrical service and to avoid conflict interferences. Coordinate installation sequence to avoid conflicts including equipment access and provide the fastest overall installation schedule.

1.03 STORAGE AND HANDLING

- A. Refer to the Basic Electrical Requirements section of the specifications for storage and handling requirements.
- B. Non-metallic conduits stored on-site prior to installation shall be stored on a surface off of the ground and shall be protected from the direct rays of the sun and from debris.
- C. Damaged, oxidized, warped, improperly stored material or material with excessive amounts of foreign debris will be removed from the project and replaced with new materials, at no cost to the University.

PART II - PRODUCTS

2.01 GENERAL MATERIALS REQUIREMENTS

- A. Furnish all materials specified herein.
- B. All conduit and fittings shall be listed and bear a label by Underwriters' Laboratories (UL) for use as raceway system for electrical conductors.

- C. Raceway is required for all wiring, unless specifically indicated or specified otherwise.
- D. Size: The minimum size of conduit shall be $\frac{3}{4}$ ". The size of all conduits shall be in accordance with the CEC using 30% fill, but not less than indicated on the drawings.
- E. Bushings shall be metallic insulated type. Weatherproof or dust-tight installations shall be liquid-tight with sealing ring and insulated throat. Bushing shall be OZ/Gedney type KR, or equal (Or equal, no known equal.)
- F. Expansion and deflection fittings shall be OZ/Gedney, type DX, or equal
- G. All under floor/ground raceways will be cleaned and mandrilled before wire is installed.

2.02 EMT CONDUIT AND FITTINGS

- A. Electrical Metallic Tubing shall conform to UL 797, cold rolled steel tubing with zinc coating on outside and protective enamel coating on inside.
- B. Electrical Metallic Tubing (EMT) couplings and connectors shall be steel compression "concretetight" type. Malleable iron, die cast or pressure cast fittings are not permitted. All connectors shall be nylon insulated throat type. Fittings shall meet same requirements for finish and material as EMT conduit. Box connectors shall be equipped with insulated throat.
- C. Connectors at cabinets, boxes, and gutters shall be metallic nylon grounding type with insulated bushings.

2.03 RIGID AND IMC CONDUIT and FITTINGS

- A. Intermediate metallic conduit and rigid steel conduit shall conform to UL 6, standard weight, mild steel pipe, zinc coated on both inside and outside by a hot dipping or sherardizing process. Inside and outside of conduit shall be finished with a protective coating.
- B. Fittings for rigid steel and IMC shall be standard threaded couplings, locknuts, bushings and elbows. Fittings shall be assembled with anti-corrosion, conductive anti-seize compound at joints made absolutely tight to exclude water. All materials shall be steel or malleable iron only. Setscrew or non-thread fittings are not permitted.
- C. Bushings shall be metallic insulating type consisting of insulating insert molded or locked into the metallic body of the fittings.
- D. Erickson-type couplings may be used to complete a conduit run. IMC couplings may be the integral retractable (Uni-Couple) type.
- E. Connectors at cabinets, boxes, and gutters shall be metallic nylon grounding type with insulated bushings.

2.04 NON-METALLIC CONDUIT AND FITTINGS

- A. Non-metallic conduit shall be heavy wall, Schedule 40 PVC or Schedule 80 PVC.
- B. Non-metallic conduit fittings shall be of the same material as the conduit furnished and be the product of the same manufacturer. PVC 90° bends shall not be used. Wrapped rigid will be used in its place. Double lap of Calpico 10 mil or approved equal.

- C. Maximum length of non-metallic conduit shall be twenty feet. Mark each length clearly and durably with nominal trade size, type of material, and UL label.
- D. Material shall have tensile strength of 7,000 psi at 73.4°F, flexural strength of 11,000 psi and compression strength of 8,600 psi.
- E. Non-metallic conduit shall be suitable for direct burial without concrete encasement.
- F. All joints shall be solvent welded, 1" minimum size unless indicated on drawing.
- G. All underground or underfloor conduit shall be cleaned and mandrelled before wire is installed.

2.05 FIBERGLASS REINFORCED EPOXY CONDUITS

- A. Rigid non-metallic fiberglass reinforced epoxy conduits (FRE) shall be composed of glass filaments encapsulated in an epoxy matrix. All FRE conduits and fittings shall be pigmented with carbon black dispersed homogeneously throughout the epoxy glass matrix for UV protection. Conduit shall be suitable for continuous operation from -40°C to +110°C.

2.06 CONDUIT SUPPORTS

- A. All parts and hardware shall be zinc-coated or have equivalent corrosion protection.
- B. Conduit straps shall be single hole cast metal type or two hole galvanized metal type. Conduit clamps shall be spring steel type for use with exposed structural steel.
- C. Conduit support channels shall be 1.5" x 1.5" x 14 gauge galvanized (or with equivalent treatment) channel. Channel suspension shall be minimum ¼" threaded steel rods. Spring steel clips are not acceptable. Conduit straps shall be spring steel conduit straps compatible with channel. Wire or chain is not acceptable for conduit hangers. All installations shall meet applicable seismic requirements.
- D. Individual conduit hangers shall be galvanized spring steel specifically designed for the purpose, sized appropriately for the conduit type and diameter, and have pre-assembled closure bolt and nut and provisions for receiving threaded hanger rod. Support with ¼" threaded steel rod for individual conduits 1.5" and smaller and ⅜" rod for individual conduits 2.0" and larger. All installations shall meet applicable seismic requirements.
- E. Individual conduit straps on metal studs shall be spring steel and should wrap around entire face of stud securely biting into both edges and have provisions for screwing into stud. Size for conduit to be support. Tie wraps are not acceptable.
- F. Support multiple conduits from metal studs using pre-assembled bar hanger assembly consisting of hanger bar, retaining clips and conduit straps.
- G. Refer to Section 260500 of these specifications for additional material requirements. Refer to Seismic Control for additional seismic requirements.

2.07 FLEXIBLE CONDUIT AND FITTINGS

- A. Flexible conduit shall be steel metallic type, zinc coated on both inside and outside by hot dipping or sherardizing process.

- B. Where specified herein, indicated on the drawings, or when used in damp or wet locations, as classified by the California Electrical Code, flexible conduit shall be liquid tight. Liquid-tight conduit shall be galvanized with extruded polyvinyl covering and with water-tight connectors.
- C. All flexible conduit shall be classified as suitable for system grounding.
- D. Connectors for flexible conduit shall be steel insulated throat type rated as suitable for system ground continuity. Connectors for liquid tight flexible conduit shall be screw-in ground cone type.
- E. Flexible conduit shall not be less than $\frac{3}{4}$ " trade size and in no case shall flexible conduit size be less than permitted by the California Electrical Code for the number and size of conductors to be installed herein.
- F. No aluminum flexible conduit shall be used.

2.08 MISCELLANEOUS CONDUIT FITTINGS AND ACCESSORIES

- A. Vinyl all weather electrical tape for corrosion protection shall be Scotch #88, Tomic #85, Permacel #295 or equal.
- B. Expansion and deflection couplings shall be in accordance with UL 467 and UL 514. They shall accommodate $\frac{3}{4}$ " deflection, expansion, or contraction in any direction and shall allow 30° angular deflections. Couplings shall contain an internal flexible metal braid to maintain raceway system ground continuity.
- C. Fire and smoke stop materials shall be UL rated to maintain the fire floor or firewall partition rating.

PART III - EXECUTION

3.01 INSTALLATION

- A. General
 - 1. Conceal all conduits, except in unfinished spaces such as equipment rooms or where indicated by symbol on the drawings or as approved by the University's Representative. Run concealed in areas having finished ceilings and furred walls. Run all cross conduits and vertical risers or drops concealed in wall and/or partitions. Run vertical risers or drops up or down between wall studs. Should it be necessary to notch any framing members, notch only at locations in a location and manner approved by University's Representative.
 - 2. Exposed conduit below 8'-0" shall be rigid type.
 - 3. Provide flexible connections of short length to equipment subject to vibration or movement and to all motors. Provide a separate bonding conductor in all flexible connections.
 - 4. Support conduits per seismic guidelines outlined in section 16012.
 - 5. Maintain a minimum of 6" clearance from conduit to steam or hot water pipes.
 - 6. Leave all empty conduits with a galvanized pull wire or nylon pull rope.

7. Install as complete raceway runs prior to installation of cables or wires.
8. Flattened, dented, or deformed conduits are not permitted and shall be removed and replaced.
9. Secure rigid conduit i.e., rigid galvanized conduit and intermediate metal conduit, to sheet metal enclosures with two (2) locknuts and insulated bushing. Secure EMT to sheet metal enclosures with insulated throat connectors.
10. Fasten conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, anchors as specified on solid masonry or concrete, and machine bolts, clamps, or spring steel clips, on steel. Nails are not acceptable.
11. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until all masonry is complete. Protect conduit stud-ups during construction from damage; any damaged conduits shall not be used.
12. Seal all conduits originating from outside building from below grade, all conduits entering refrigerated spaces, i.e., freezers and coolers, and all conduits entering exterior mounted electrical equipment with insulating electrical putty to prevent entrance of moisture. Waterproofing material shall not contain creosote or polysulfides which are not compatible with the waterproofing system.
13. Install conduit with wiring, including homeruns as indicated on the drawings. Any change resulting in a savings in labor or materials is to be made only in accordance with a contract change. Deviations shall be made only where necessary to avoid interferences and when approved by University's Representative by written authorization.
14. Where conduit passes through finished walls or ceilings, provide steel escutcheon chrome plates or paint as directed.
15. Provide sleeves for conduit passing through floor slabs and/or concrete masonry walls.
16. Conduits which penetrate roof membranes shall be installed in accordance with manufacturer's recommendations and architectural specifications.
17. Separate raceway systems are to be installed for power systems and for control, signal and communications systems. Do not install control, signal or communications cables in the same raceways as branch circuit or feeder cables, unless indicated otherwise on the drawings.
18. Provide expansion fitting in all conduits where length of run exceeds 200' or where conduits pass building expansion joints.
19. Telephone, and data, and all service entrance conduits shall be installed with wide sweep 90° bends; minimum radius shall be 60".

B. Uses Permitted

1. Galvanized rigid conduit or IMC shall be used as follows:
 - a. For primary and secondary service (except when installed below the ground floor slab and above the building mat slab) and for secondary unit

substations, switchboard, motor control center, dry-type transformer and panelboard feeders.

- b. Buried in or in contact with earth to be half-lapped with omic pipe wrapping tape with sealant applied to all joints.
 - c. In poured concrete walls or block walls, in concrete vaults, floor and roof construction, provided a minimum of 2" of cover is maintained.
 - d. In all walls up to the first outlet box where fed from rigid conduit in damp locations or locations exposed to the weather.
 - e. In exposed locations below 8' above the floor, including all mechanical rooms.
 - f. All elbows for underground plastic conduit.
 - g. All conduits for interior wiring systems whose voltage is above 600 volts.
 - h. All conduits entering refrigerated spaces.
 - i. Elsewhere where indicated on the drawings.
 - j. For emergency branch feeders and circuits installed outside of building.
2. Electrical metallic tubing (EMT) shall be used as follows:
- a. Concealed in stud partitions and hollow masonry walls.
 - b. For connections from junction box to lighting fixtures except in accessible ceilings.
 - c. Above in suspended or accessible ceilings above 8'.
 - d. Exposed in dry locations above 8 feet where not subjected to mechanical damage.
 - e. In furred ceiling spaces.
 - f. For fire alarms system conduit. Paint red 6" wide every eight feet.
3. Rigid non-metallic conduit shall be used as follows:
- a. For the branch circuit wiring for exterior lighting pole bases and bollards (horizontal runs only).
 - b. All elbows, both vertical and horizontal, shall be GRC.
 - c. Any non-metallic PVC conduit used for emergency power systems shall be schedule 80 PVC.
 - d. The communications conduit shall be schedule 40 PVC.

4. All other conduit, unless excluded herein, not permitted in accordance with the California Electrical Code, or otherwise indicated on the drawings, shall be electrical metallic tubing (EMT).
5. Conduit types shall not be mixed indiscriminately with other types in the same run, unless specified herein or required by the CEC.
6. Use flexible conduit for connections to motors, dry type transformers, electrical duct heaters, unit heaters, expansion joints, and flush mounted lighting fixtures. Conduit must be secured.
 - a. Flexible conduit used for connection of motor, dry type transformers, electric duct heaters, and unit heaters, shall not exceed 18" in length.
 - b. Flexible conduit from outlet box to flush mounted lighting fixture shall not exceed 6 3 feet in length.
 - c. Maintain ground continuity through flexible conduit with green equipment grounding conductor; do not use flexible conduit for ground continuity.
 - d. Liquid tight conduit shall be used to connect equipment in mechanical equipment rooms and exterior installations, and for final connections to all equipment containing water or other liquid service.
7. Service entrance conduits shall be installed "outside" of the building as defined by the CEC. Provide concrete encasement where required.
8. No conduit requiring cutting of cross-webs of concrete masonry units is permitted. Conduit shall be threaded through cells or concrete masonry units lowered around conduit. Neither horizontal joint reinforcement nor bond beam reinforcement shall be cut for conduit installation.
9. Where hazardous locations, as classified by the California Electrical Code, exist, all conduits and fittings and the installation of these materials shall comply with Article 500 of the California Electrical Code.
10. LB condulets for conduits larger than 1-1/2" I.D. shall not be used unless of the mogul design and secured to the building structure within 6" below and along the side of the condulet.

C. Below Grade Raceway Installations

1. Direct Burial Conduit
 - a. Unless otherwise indicated install top of conduits 24" minimum below finished grade. Maximum depth shall be 36". Utility primary conduit shall be 48" below finished grade. All conduits not under building slabs or parking lots shall be encased in a minimum of 3" concrete. All concrete for primary conduit shall contain a red pigment dye to make it readily noticeable. Provide 10% red oxide per cubic yard of material.
 - b. Install top of conduits-6 18" minimum below bottom of building slabs.
 - c. Install top of conduits 30" minimum below grade, below roads and any other paved surfaces.

- d. Place a 4" wide, bright yellow, non-biodegradable plastic tape 12" above all underground conduit outside of building foundation.
- e. Where transition is made from below grade PVC installation to a metallic conduit system above grade or slab, and at transition at manholes and service switchgear, make transition with rigid galvanized elbow and extend through slab or above grade with galvanized rigid steel conduit. For corrosion protection, where the elbow penetrates surface, wrap with vinyl all-weather electrical tape or coat with bituminous asphaltic compound, for 6" above and below concrete surface.
- f. For excavation and backfilling, refer to Section 16010 and Division 2 of these specifications.
- g. Conduit shall be run following the most direct route between points and the route shall be coordinated with other disciplines.
- h. All open conduit ends shall be plugged during construction to prevent water, mud, concrete and debris from entering. Prior to the installation of cables, each conduit shall be cleaned by pulling a standard, flexible mandrel not less than 12" long, with diameter approximately ¼" less than inside diameter of conduit, through the conduit. In addition, a brush with soft bristles and diameter approximately equal to inside diameter of conduit shall be pulled through conduit.
- i. For all underground runs of two or more conduits, separators or spacing blocks made of plastic or other suitable nonmetallic, nondecaying material shall be placed on not greater than four foot centers. They shall be of the interlocking type both horizontally and vertically. ducts shall be anchored to prevent movement during placement of concrete.
- j. Before installing the last 8" of lift of backfill for all primary feeders and for secondary service feeders, install plastic identification tape warning of buried electrical lines the full length of duct bank trench.

D. Raceway Installations Within Concrete

1. Conduit can only be installed within concrete where shown on the drawings or with the agreement of the Structural Engineer of Record
2. Conduit shall be run following the most direct route between points.
3. Conduit shall not be installed in concrete which is less than 3" thick or where the outside diameter is larger than $\frac{1}{3}$ of the slab thickness.
4. Conduits installed in concrete slabs shall be buried in the concrete slab. Wire low conduits to upper side of the bottom reinforcing steel, and upper conduits to the lower side of the top reinforcing steel. Separate parallel runs of conduits within slab by at least 4"- 3".
5. Conduits shall not be installed within shear walls unless specifically indicated on the drawings. Conduits shall not be run directly below and parallel with load bearing walls.
6. Protect each metallic conduit installed in concrete slab or conduits 1.5" and smaller passing through a concrete slab against corrosion where conduit enters and leaves concrete by wrapping conduit with vinyl all-weather electrical tape.
7. Conduit stub-up penetrations through slabs shall be installed with the top of a threaded conduit coupling flush with the finished slab.
8. Protect all conduits entering and leaving concrete floor slabs from physical damage during construction.
9. Install all conduits penetrating rated fire floors to maintain the fire and thermal rating of the floor penetrated.

E. Concealed (Above Ceilings and in Walls) and Exposed Raceway Installation

1. Conduit shall be run parallel or at right angles to walls, ceilings, and structural members.
2. Support branch circuit conduits at intervals not exceeding 10' and within 3' of each outlet, junction box, cabinet or fitting. Attach individual branch circuit conduits to structural steel members with spring steel type or beam conduit clamps and to non-metallic structural members with one hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hangar rod and conduit clamp assembly. Multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.
3. Attach feeder conduits larger than 1" trade diameter to or from structure on intervals not exceeding 10' with conduit beam clamps, one hole conduit straps or trapeze type support in accordance with support systems described for branch circuit conduits.
4. Single-flange clamps are unacceptable
5. Exposed conduits shall be painted, see Section 09900 of the specifications.

6. For fire alarms system conduit. Paint red 6" wide every eight feet.
7. Install conduit sleeves in slabs where conduits 2.0" and larger pass through. Sleeves shall extent 1" minimum above finished slab. Seal all spare sleeves and between conduits and sleeves to maintain fire rating and to make watertight and smoketight.
8. Install all conduits or sleeves penetrating rated firewalls or fire floors to maintain fire rating of wall or floor.
9. Conduits rigidly secured to building construction on opposite sides of a building expansion joint shall be provided with an expansion and deflection coupling. In lieu of an expansion coupling, conduits 2-1/2" and smaller may be provided with junction boxes on both sides of the expansion joint connected by 15" of slack flexible conduit with bonding jumper.

3.02 ADJUSTMENT, CLEANING AND PROTECTION

- A. Clean: Upon completion, clean all installed materials of paint, dirt, and construction debris. All conduit systems shall be cleaned of water and debris prior to the installation of any conductors.

END OF SECTION 26 05 33

SECTION 26 24 16 PANEL BOARDS

PART I - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Lighting and appliance panel boards, shall be rated 1200A or less.
 2. Distribution panelboards, shall be rated 1200A or less.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Division 1. Include all physical dimensions, gutter space, physical construction, and list the following information:
1. Panel designation.
 2. Voltage rating.
 3. Current rating.
 4. Top, bottom or through feed lugs, lug size.
 5. Main overcurrent device size.
 6. Branch device schedule, listing size and poles.
 7. Surface trim or recessed.
 8. Fault current rating of the panel and devices.
 9. Circuit breaker mounting method - bolt-in.
 10. Bus material.
 11. Indicate any special requirements including key locking, split bus, contactor panels, double panels, or panels in special NEMA enclosures.
 12. Indicate which panel boards are electronic grade.
- B. Operation and Maintenance Manuals: Submit in accordance with Division 1, in the following format.
1. Provide an 8-1/2" x 11" typewritten panel schedule for each panel, protected by a mylar jacket, and bound in a three ring binder.
 2. Schedules shall include:
 - a. Panel designation.
 - b. Panel location.

- c. Voltage, phase, current rating.
 - d. Main overcurrent device size.
 - e. Feeder and branch circuit listing indications circuit number and description of loads served.
 - f. Source of panel feeder.
3. Panel schedule book shall be assembled based on "As Built" information, and submitted to the University upon completion of the project. Provide one hard copy of book and provide one CD or Zip-disk containing updated panel schedules in excel format.

1.03 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association (NEMA).
- B. American National Standards Institute (ANSI).

PART II - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General Electric, Spectra
- B. Square D
- C. Or equal

2.02 PANEL BOARDS - GENERAL CONSTRUCTION

- A. Backbox: Code gauge galvanized steel, minimum 20" wide and 5-³/₄" deep, unless otherwise indicated or required. Provide gutter space in accordance with code, including additional space where required for feeder cable installations. Corners shall be lapped and riveted.
- B. Interior: Provide the number of overcurrent devices and spaces as indicated on the plans and in the Panel board Schedule. Panel bus bars shall be copper only and shall be aligned and rigidly supported on the back pan by insulators connected to a removable mounting panel. Lugs shall be sized for the wire indicated on the plan. Full length vertical buses and cross overcurrent device connection, including all hardware, shall be provided and installed for all spaces. When buss bars are not factory tapped, (all) breaker hardware must be factory mounted.
- C. Neutral Bus: Double capacity of the phase bus with lugs and terminals for terminating the sizes and quantity of neutral conductors indicated and required.

- D. Ground Bus: 50% capacity of the phase bus with lugs and terminals for terminating the sizes and quantity of ground conductors indicated and required.
- E. Where indicated on the drawings provide isolated ground bus
- F. Trim: Cabinet front with concealed trim clamps and flush lock all keyed alike. Trim shall be dead front with metal frame index holder on inside of door. Panel board enclosures shall be provided with either a flush or surface trim as indicated in the Panel board Schedule, or shown on the plan. Trim shall be painted baked on ANSI #61, light gray enamel. Covers shall be hinged so that they swing away to provide full access to the interior of the panel without removing the cover. Covers designed for more than one panel section shall not be permitted. Hinged type door covering all circuit breakers shall be included in all panel trims providing door in door construction.
- G. Series rated breakers are not allowed.
- H. Panel board Rating:
 - 1. Voltage and ampere rating as indicated in the Panel board Schedule or plans.
 - 2. Integrated or series rated devices shall not be used to meet the specified fault current levels. .
 - 3. Provide service entrance rated and labeled panel boards where required for the application.
 - 4. Circuit breakers shall have 80% continuous rating unless indicated otherwise and shall not have continuous loads that exceed 80% of the continuous rating. Provide 100% rated circuit breakers only where required by code or where indicated.
 - 5. Provide 25% spare capacity in all panelboards.

2.03 PANEL BOARDS – 120/208-VOLT

A. Branch Circuit Panel boards:

1. Panel boards shall be bolt-on circuit breaker type with the short circuit interrupting ratings required for the available fault current.
2. Circuit breakers shall be 100% rated.
3. Minimum fully rated Short Circuit Rating: 10,000-amperes rms or as shown on Drawings.

B. Distribution Panel boards:

1. Panel boards shall be bolt-on circuit breaker type with the short circuit interrupting ratings required for the available fault current.
2. Minimum fully rated Short Circuit Rating: 18,000-amperes rms, or as shown on Drawings.

C. Circuit breakers shall be molded case, thermal magnetic trip type with common trip handle for all poles.

D. Circuit breakers shall be a minimum of 100-ampere frame. 15-ampere through 100-amperes trip size shall fit in the same pole spacing.

E. Provide a suitable circuit breaker, sized for the load, for each branch circuit shown on the plans, if not identified or noted in the Panel board Schedule.

F. Refer to panel board schedules and drawings for which 120/208-volt panel boards shall be electronic grade. Refer to the Transient Voltage Surge Suppression Section 26 24 16 of this specification for additional requirements.

2.04 PANEL BOARDS – 277/480-VOLT

A. Branch Circuit Panel boards:

1. Panel boards shall be bolt-on circuit breaker type with the short circuit interrupting ratings required for the available fault current.
2. Minimum fully rated Short Circuit Rating: 35,000-amperes rms, or as shown on Drawings.
3. Circuit breakers shall be 100% rated.

B. Distribution Panel boards:

1. Panel boards shall be bolt-on circuit breaker type with the short circuit interrupting ratings required for the available fault current.
2. Minimum fully rated Short Circuit Rating: 42,000-amperes rms, or as shown on Drawings.
3. Circuit breakers shall be 100% rated.

- C. Circuit breakers shall be molded case, thermal magnetic trip type with common trip handle for all poles.
- D. Circuit breakers shall be a minimum of 100-ampere frame. 15 ampere through 100 amperes trip size shall fit in the same pole spacing.
- E. Provide a suitable circuit breaker, sized for the load, for each branch circuit shown on the plans, if not identified or noted in the Panel board Schedule.

PART III - EXECUTION

3.01 INSTALLATION

- A. Mount panel boards securely to the building structure. Panelboards surface mounted on steel stud and gypsum board walls shall be mounted to channel, bridging two or more studs. Installation shall comply with all applicable seismic requirements.
- B. Provide spacers where panelboards are surface mounted on outside walls, to space the panel 1-½" from the wall.
- C. Connect circuits shown on the plans for a balanced 3-phase load.
- D. Install panel boards in conformance with NEMA PB 1.1 and manufacturer's installation instructions. Maximum mounting height - 6'-6" to top of panel board. Panels weighing 20 pounds or more shall be installed per details on the drawings, in accordance with the CBC.
- E. Stub (2) spare one inch conduits to accessible location above ceiling out of each recessed panel board.
- F. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of all electrical connections.

3.02 IDENTIFICATION

- A. Provide labeling as specified in Section 260553.
- B. Provide a typewritten index of circuits inside the door of the panel board. Type directing to indicate actual field installation, with odd numbering on left and even numbering on right.
- C. Provide identification of ungrounded conductors according to the CEC at each branch circuit panel board. Install permanent typewritten index similar to index of circuits.

3.03 TESTING AND ADJUSTMENT

- A. Perform the short-circuit test on the overcurrent devices by simultaneously connecting the fault to each panel board overcurrent device with the panel board connected to its rated voltage source.
- B. Method of testing per UL Standard 67.
 - 1. Test data showing the completion of such tests furnished to the University's Representative before the submittal of approval drawings.

2. Testing of panel board overcurrent devices for short-circuit rating only with the overcurrent devices individually mounted is not acceptable.
3. Adjust all variable trip circuit breakers to the proper setting for the load each circuit breaker is protecting. Retest to verify the setting is correct and make adjustments as needed. After the settings are completed, record the panel number, device number with the load trip point that the device has been adjusted for and the name and size of the load on a typed separate sheet of paper. Place one copy of this paper in the panel directory pocket and provide one copy with each operations and maintenance manual.

3.04 INSPECTION

- A. Examine area to receive panel boards to assure adequate clearance for installation.
- B. Check that walls are proper thickness for recessed panels.
- C. Start work only after any unsatisfactory conditions are corrected.

3.05 TELECOMMUNICATIONS SPACE (TS) ELECTRICAL REQUIREMENTS

- A. A sub-panel or at a minimum, all TS's shall be provided dedicated electrical service in all ADF/BDF/IDF (ER/TR) rooms. The estimated electrical load for the telecommunications space shall not exceed 80 percent of the panel.
- B. Dedicated power circuits from shared panelboards shall be provided with both transient voltage surge suppression and electrical high frequency noise filtering.
- C. If a low number of telecommunications spaces are planned, one electrical panel may serve multiple telecommunications spaces as a design alternative.
- D. Sub-panels shall be located near the room entrance door, whenever possible, to conserve wall space and should be connected to an emergency power source if available to the building. Emergency power is especially important in the TS's that house Digital Loop Carrier Systems to insure voice and emergency systems remain operational during power outages that may extend past the systems battery backup capability.
- E. HVAC systems shall not use the same electrical panel that is used to support telecommunications spaces.

END OF SECTION 26 24 16

SECTION 27 05 00
COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes, but is not necessarily limited to, common standards and procedures for the Communications Work.
- B. This Section outlines areas of responsibility between Owner, Architect, and Contractor.
- C. Owner will assist with a collaborative process to determine the most cost effective and efficient means to reach the common goal of providing communications within the facility for the project, including assessing user needs and assessing required pathways. The Owner is available upon request to assist at no additional cost to the project. It is incumbent upon the construction team management to approach and engage the Owner at the appropriate times for collaboration.
- D. As part of the project, the construction team must design, engineer, and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter "support") of the Communications Systems; and provide engineering of such support by parties licensed to perform work of this type in the project jurisdiction.

1.2 ITEMS PROVIDED BY OWNER

- A. Registered Communications Distribution Designer (RCDD) support services
- B. IT project management
- C. Submittal approvals

1.3 ITEMS PROVIDED BY CONSTRUCTION TEAM

- A. Building Drawings and Floor Plans
- B. Site Plans
- C. Furniture Plans
- D. As-Built Drawing Submittals
 - 1. Cabling Schedule
- E. Attachments to structure
- F. In wall cabling supports
- G. Horizontal Wire Managers
- H. Construction Clean Closet Cleaning

1.4 RELATED SECTIONS

- A. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
- B. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
- C. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

1.5 REFERENCES AND STANDARDS

- A. UC Davis Health Telecommunications Standards
- B. American National Standards Institute (ANSI)
- C. Telecommunications Industry Association (TIA)
- D. Building Industry Consulting Services International (BICSI)
- E. American Society for Testing and Materials (ASTM)
- F. Institute of Electrical and Electronic Engineers (IEEE)
- G. National Electrical Manufacturers Association (NEMA)
- H. National Fire Protection Association (NFPA)
- I. NFPA 70 National Electrical Code
- J. Underwriters Laboratories, Inc. (UL)
- K. Local Authorities Having Jurisdiction (AHJ)

1.6 ABBREVIATIONS

- A. ADA Americans with Disabilities Act
- B. AFC Above Finished Ceiling
- C. AFF Above the Finished Floor
- D. BDF Building Distribution Frame – See Telecommunications Room (TR)
- E. BLDG Building
- F. CAT Category (Related to network cable types)
- G. DIV Division
- H. (E) Existing
- I. ER IT Equipment Room – See Telecommunications Room (TR)
- J. GE Grounding Equalizer – Part of the Telecom Grounding System

- K. HR Homerun
- L. ID Inside Diameter
- M. IDF Intermediate Distribution Frame – See Telecommunications Room (TR)
- N. IT UC Davis Health IT Department (also UC, UCDH, UCD IT, IT Facilities)
- O. LAN Local Area Network
- P. MAX Maximum
- Q. NIC Not in Contract
- R. OD Outside Diameter
- S. TBB Telecom Bonding Backbone – Part of the Telecom Grounding System
- T. TGB Telecommunications Ground Busbar
- U. TMGB Telecommunications Main Ground Busbar
- V. TR Telecommunications Room, TR may also be used interchangeably with ER, IDF, MDF, or Communications Room
- W. TYP Typical
- X. UCD UC Davis Health IT Department (also UC, UCDH, UCD IT, IT Facilities)
- Y. UFE University Furnished Equipment
- Z. UON Unless Otherwise Noted

1.7 DEFINITIONS

- A. Telecommunications Room (TR) – An enclosed space for housing telecommunications equipment, cable, terminations, and cross-connects. The room is the recognized cross-connect between the backbone cable and the horizontal cabling.
- B. Intermediate Distribution Frame (IDF) – See Telecommunications Room (TR)
- C. Entrance Facility (EF) (Telecommunications) – An entrance to the building for both private and public network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.
- D. Pathway – A physical infrastructure utilized for the placement and routing of telecommunications cable.

1.8 QUALITY ASSURANCE

- A. Contractor Firm Qualifications:

1. All work for the Communications (low voltage) Infrastructure installation shall be self-performed by the Communications Contractor; subcontractors shall not be allowed under the Communications Contractor.
- B. Communications Contractor shall:
1. Be a Panduit Corp. PCI (Panduit Certified Installer) Design and Installation Contractor or approved equal.
 2. Be a firm which is regularly and professionally engaged in the installation and testing of the specified communications equipment and infrastructure.
 3. Be licensed to install low voltage electronic cabling systems in the State of California where applicable (C7 License).
- C. Communications Contractor shall demonstrate experience in providing successful installation of data infrastructure systems:
1. Submit documentation for a minimum of three and a maximum of five successful low voltage communications infrastructure system installation projects completed within the past three years.
- D. Contractor Key Personnel Qualifications:
1. Provide key personnel who are regularly and professionally engaged in the business of the application, installation and testing of the specified low voltage communications systems, equipment and infrastructure. There may be one key person or more key persons proposed for this project depending upon how many of the key roles each has successfully provided.
 2. Each of the key personnel shall demonstrate experience in providing successful low voltage communications systems, equipment and infrastructure within the past three years.
- E. A Registered Communications Distribution Designer (RCDD) shall be employed by the Design Builder and directly engaged in the project for all Communications Infrastructure design and installation efforts.
1. The RCDD shall be a direct employee of the Communications Contractor, within the Design Build team structure.
 2. The RCDD shall be required to have oversight and supervision of the entire Communications Infrastructure installation process and quality control.
 3. The RCDD shall be the Design Builder's Designer of Record for the Communications Infrastructure scope of work.
 4. RCDD direct responsibilities shall include but may not be limited to: Thorough coordination with Owner regarding all design and installation efforts related to the project. A Pre-construction coordination meeting and site inspection with Owner prior to beginning any work. Oversight of Communications installation efforts, development of shop drawings and assembly of product data submittals. Quality control review and stamping of finalized Communications as-built drawings for submittal to Owner. Quality control review of Communications systems installation throughout the entire construction phase, to ensure all work is performed in compliance with approved construction drawings.
- F. Critical on-site quality control installation reviews to be conducted in conjunction with Owner technical staff shall include but may not be limited to:
1. Verifying proper installation of all Communications cable tray, backbone conduits, device back boxes, conduit infrastructure and cabling pathways. Site inspection and sign-off must be performed prior to concealing conduit infrastructure and prior to the installation of any low-volt cabling.

2. Verifying proper installation of all Communications cabling. Site inspection and sign-off must be performed prior to closing-up associated accessible ceilings.
 3. Verifying the layout and installation of all equipment and cabling within the Telecom Rooms, throughout the duration of the construction phase.
- G. Supervisors and installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel. Submit documentation for a minimum of three and a maximum of five successful cabling system installations for each of the key personnel in an environment resembling that which is being bid upon.
1. In lieu of BICSI certification, supervisors and installers assigned to the installation of this system or any of its components shall have a minimum of three years' experience in the installation of the specified copper and fiber optic cable and components. The personnel on site performing work pertaining to this job shall be certified on the system being installed. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.
 2. Submit documentation for a minimum of three and a maximum of five successful cabling system installations for each of the key personnel in an environment resembling that which is being bid upon. Documentation for each key person shall include at least two successful system installations provided that are equivalent in system size and in construction complexity to the telecommunications system proposed for this project. Include specific experience in installing and testing telecommunications systems and provide the names and locations of at least two project installations successfully completed using optical fiber and copper telecommunications cabling systems.
 3. All of the existing telecommunications system installations offered by the key persons as successful experience shall have been in successful full-time service for at least 18 months prior to the issuance date for this project.
 4. Provide the name and role of the key person, the title, location, and completed installation date of the referenced project, the referenced project Owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity.
- H. Indicate that all key persons are currently employed by the Communications Contractor or have a commitment to the Communications Contractor to work on this project. All key persons shall be employed by the Communications Contractor at the date of issuance of this project, or if not, have a commitment to the Communications Contractor to work on this project by the date that the bid was due to the Owner's Representative.
1. Note that only the key personnel approved by the Owner's Representative in the successful proposal shall perform work on this project's low voltage systems, equipment and infrastructure. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitutions for the Communications Contractor's key personnel require approval from the Owner's Representative.
- I. Designated Supervisor: Designate which key person will serve as a designated supervisor for the project. This supervisor shall be present and responsible for the project site during all phases of installation and testing of the Work in this Section. This supervisor shall be the same individual through the execution of the Work unless illness, loss of personnel, or other circumstances reasonably beyond the control of the Contractor intervene.
- J. Submit documentation for a minimum of three and a maximum of five successful low voltage systems, equipment and infrastructure installations for each of the key personnel.

- K. Documentation for each key person shall include at least two successful system installations provided that are equivalent in system size and in construction complexity to the low voltage communications systems, equipment and infrastructure proposed for this project. Include specific experience in installing and testing communications systems and provide the names and locations of at least two project installations successfully completed using systems and equipment substantially similar to those specified for this project.
- L. All of the existing low voltage communications systems, equipment and infrastructure installations offered by the key persons as successful experience shall have been in successful full-time service for at least 18 months prior to the issuance date for this project.
- M. Provide the name and role of the key person, the title, location, and completed installation date of the referenced project, the referenced project Owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity.

1.9 SUBMITTALS

- A. All Submittals shall be provided electronically in PDF format. All Drawing Submittals shall be provided in PDF and AutoCAD (latest version) .DWG format.
- B. Submittals shall be organized in a coordinated package complete with all information specified herein. Incomplete or uncoordinated submittals will be returned with no review action.
- C. Contractor shall submit the following items:
 - 1. Contractor Key Personnel and Certifications
 - 2. Complete Bill of Materials (BOM) List
 - 3. Manufacturer Product Data Sheets, as defined below
- D. Manufacturer Product Data Submittals shall include:
 - 1. Submit product data sheets for all equipment being provided
 - 2. Collate in sequence by Section Number, and clearly mark proposed product on data sheet. Include Safety Data Sheet, where applicable.
 - 3. Clearly identify any proposed product substitutions or known deviations.
- E. Precede each submittal book with a summary TOC. per example schedule below:
 - 1. Specification Section
 - 2. Drawing Reference
 - 3. Manufacturers Model No.
- F. The following is a general summary list of Submittal items required to be delivered at 30-day burn-in period.
 - 1. As part of project close-out activities, Contractor shall submit Record Documents for review and approval by the Owner.
 - 2. All Record Documents shall be provided electronically in PDF format. All Record Document Drawings shall be provided in PDF and AutoCAD (latest version) DWG format.

1.10 CLOSEOUT SUBMITTALS

- A. Contractor shall submit the following items:

1. Record As-Built Shop Drawings indicating the final, 'as-built' condition of all associated equipment, infrastructure, and work.
- B. Enlarged Room Plans and Elevations indicating:
- C. Provide dimensioned drawings for all telecommunications rooms. Complete, dimensioned rack and wall elevations of all equipment. Consideration must be given to equipment heights within. Plywood backboards and grounding equipment.
- D. Racks, cabinets, cable tray, ladder rack, wire management. Termination equipment for all copper and fiber cabling. Conduit and cable entrance points and fire stopping. Electrical panels, power circuits and HVAC provisions.
- E. Ensure coordinated arrangement of equipment with other trades. Typical Device Installation Details indicating: J-hooks, conduit, cable tray, and associated support systems. Network outlet faceplate layout and wiring terminations. Device back box and conduit rough-in requirements.
- F. Details of other associated devices and equipment.
- G. The shop drawing package must be stamped and signed by a Registered Communications Distribution Designer (RCDD) and by a Professional Engineer (PE) licensed in the project jurisdiction for work of this type.
- H. Cable Certification Test Results. Submit electronically and include associated software license as applicable.
- I. Completed punch list reports.
- J. Manufacturer Operation and Maintenance (O&M) Manuals.
- K. Warranty information.
- L. Keys and any portable equipment.

1.11 WARRANTY SERVICE

- A. Closeout Submittals, Warranties and Guarantees, provide the following.
 1. Response Time: Provide a qualified technician familiar with the work at the project site within four hours after receipt of a notice of malfunction. Provide the Owner's Representative with telephone number attended 10 hours a day, five days a week, to be called in the event of a malfunction.
 2. Provide all Warrantees as defined in each Communication Systems Section.
- B. PanGen Structured Cabling Solutions System Warranty
 1. Contractor shall provide a Panduit Certification Plus System Warranty on all installed copper and fiber permanent links. Such warranty shall provide a complete system warranty to guarantee high end-to-end performance for all applications designed to operate over the class of cabling installed. The guarantee shall include all connectivity components and cable within the permanent link and cover the system for duration of 25 years.

PART 2 - MATERIALS

2.1 COMMUNICATIONS SYSTEMS PRODUCTS SUMMARY

- A. The following is a general summary list of Communications Systems equipment, components, and cabling required for the project. This is not intended to be a comprehensive list of materials. See additional Sections for complete materials requirements.
- B. Racks: Cooper B-line SB85219084FB (seismic) | SB556084XUFB (Standard) Optional eight-foot racks where applicable.
- C. Wire Managers: Panduit PEV Series full height vertical cable manager.
 - 1. Panduit PEV10 10" Wide Front/Back unless otherwise noted on plans
 - 2. Panduit PED Series dual hinged metal door installed at front face of vertical wire manage
- D. Telecommunications Ground Bar (TGB) CPI_Mfg.Part:40153-012
- E. Data Patch Panels: Panduit CP48WSBLY
- F. Fiber Terminations: LC
- G. Modular Jack CAT6A
 - 1. Panduit Mini-Com CL6X88TGVL
 - 2. Colored Icons as needed per UC service designation
 - 3. Icons are Panduit PAN_CID(XX) (gray for cables in ceiling)
- H. Copper cabling, Category 6A (Data)
 - 1. High Speed, TIA Category 6A cabling, Plenum Rated
 - 2. General Cable GenSpeed 6A Part No. 7141877 Purple
- I. Copper cabling, Category 6A Shielded [JOV Paging]
 - 1. High Speed, TIA Category 6A Shielded cabling, Plenum Rated
 - 2. General cable GenSpeed 6A Part No. 7131789
- J. Telecommunications Outlets (Workstation side)
 - 1. Modular Furniture Surface Mount Box, Black
 - 2. Panduit CBXQxBL-A Where x =number of ports
 - 3. Modular Surface Mount Box Attachment System - Mini-Com CBM-X magnetic
 - 4. Modular Surface Mount Box Blank Insert - Panduit CMB(BL)
- K. Faceplate (Workstation side)
 - 1. Panduit Mini-Com Stainless Steel Faceplates Single Gang CFP {2,4,6} SY or Double Gang CFP {4,8,10} S-2GY
 - 2. Faceplate Blank Insert – Panduit CMB(WH)

PART 3 - EXECUTION

3.1 TELECOMMUNICATIONS SPACES

- A. Telecom Room (TR) minimum size 10' x 12'.
- B. UC Davis Health Telecommunications Standards do not include provisions for AV, unless otherwise indicated in the Design Criteria for the project. IT will be cooperative in assessing some parameters as they interact with IT support systems.
- C. Telecommunication Spaces are to use EZ-Path Fire-Rated Pathways systems for cabling access.
- D. Provide 36" of working clearance surrounding racks and electronic equipment
- E. A positive pressure type of HVAC system using hot and cold aisles
- F. Walls shall be covered with fire-resistant treated plywood, and all surfaces sealed to mitigate airborne dust.
- G. IT uses a typical three-rack configuration with a B-line seismic for equipment and a standard 19" rack for cabling. Vertical wire management for planning shall be sized at 10" unless otherwise noted on the drawings.

END OF SECTION

SECTION 27 05 26
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding of communications work, including but not limited to:
1. Cable shields, communications racks, cabinets and enclosures.

1.2 SYSTEM DESCRIPTION

- A. Provide telecommunications grounding system as described herein.
- B. Except as otherwise indicated, the complete communications installation including the racks, cabinets, panels, cable tray, runway, lightning protectors cable shields and splice cases provided under the work of this project shall be completely and effectively grounded in accordance with all Code and Standards requirements, whether or not such connections are specifically shown or specified.
- C. Resistance:
1. Resistance from the farthest ground bus through the ground electrode to earth shall not exceed 5 Ohms or the requirements of ANSI-J-STD-607-A-2002, whichever is more restrictive.
 2. Resistance from Communications racks Buss ground to UFER ground must remain less than or equal to the electrical ground presented at A/C outlet for electronic equipment in the communications rack.

1.3 RELATED SECTIONS

- A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS
- B. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
- C. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS
- D. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 2 - PRODUCTS

2.1 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)

- A. Copper ground bar, Telecommunications Grounding Bus bar provides a central ground attachment point for telecommunications bonding backbones, TR equipment, racks, cable runways, sleeves, and other system located in the Telecommunications Room. All Grounding Bus bars shall be listed. Hole patterns on Bus bars accommodate two-hole lugs per the recommendation of BICSI and TIA-607 standards. Insulators electrically isolate Bus bars from the wall or other mounting surfaces.

- B. Manufacturer:
 1. CPI Mfg. Part: 40153-12
 2. Or approved equal

2.2 GROUNDING AND BONDING CONDUCTORS

- A. General purpose insulated: UL listed and code sized copper conductor, with dual rated THHN/THWN, insulation color identified green.
 1. Cable jacket marking:
 - a. Must be legible and shall contain the following information: Manufacturer's name
 - b. Copper conductor gauge, UL listing
 - c. Cable jacket shall be green with black lettering
- B. Telecommunications Bonding Backbone cable:
 1. 3/0 AWG THHN/THWN CU- Must be UL listed.
- C. Telecommunications Bonding Conductor:
 1. Sizing of the telecommunications bonding conductor per ANSIJ-STD-607-B

TBB/GE linear length m (ft)	TBB/GE size (AWG)
less than 4 (13)	6
4 - 6 (14 - 20)	4
6 - 8 (20 - 26)	3
8 - 10 (26 - 33)	2
10 - 13 (33 - 44)	1
13 - 16 (44 - 52)	1/0
16 - 20 (52 - 66)	2/0
20 - 26 (67 - 84)	3/0
26 - 32 (85 - 105)	4/0
32 - 38 (106 - 125)	250 kcmil
38 - 46 (126 - 150)	300 kcmil
46 - 53 (151 - 175)	350 kcmil
53 - 76 (176 - 250)	500 kcmil
76 - 91 (251 - 300)	600 kcmil

Greater than 91 (301)	750 kcmil
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- D. Manufacturers:
1. General Cable
 2. Harger Lightning & Grounding
 3. Or approved equal.

2.3 COMPRESSION CONNECTOR LUG

- A. Long-barrel compression lugs shall be used on all ground wire. Copper alloy body.
1. Provide lug size to match conductor being terminated.
 2. Provide 2-hole pattern lugs.
 3. Provide each lug with silicon bronze hardware, including 2 bolts, 2 split lock washers and 2 nuts.
- B. Manufacturer:
1. Panduit
 2. Harger Lightning & Grounding GECLBxxx (xxx depending on cable Size)
 3. Or approved equal.

PART 3 - EXECUTION

3.1 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS, OR SPLICES

- A. Where required by the Specifications, grounding conductors shall be spliced together, connected to ground rods or connected to structural steel using exothermic welds or high-pressure compression type connectors.
- B. Exothermic welds shall be used for cable-to-cable and cable-to-ground rod and for cable to structural steel surfaces. Exothermic weld kits shall be as manufactured by Harger Lightning & Grounding, Cadweld, Thermoweld or approved equal. Each particular type of weld shall use a kit unique to that type of weld.
- C. High-pressure compression type connectors shall be used for cable-to-cable connections. Connections shall be as manufactured by Thomas & Betts #53000 series, Burndy "Hy-Ground or approved equal.

3.2 GENERAL EXECUTION

- A. Provide Grounding & Bonding according to the most restrictive requirements of ANSI-J-STD-607-B, California Electrical Code Article 250 and references therein and California Electrical Code Article 800.
1. In the event of conflicting requirements, California Electrical Code requirements shall prevail.
- B. Contractor shall supply all materials required to furnish and install a complete functional telecommunications grounding system.

- C. The grounding system shall be installed in accordance with the manufacturer's instructions and as indicated on Contractor's submittal documentation, prior to final acceptance/approval by the University.
- D. Point of connection:
 - 1. Under Work of this Section, install a complete Telecommunications Grounding System, leaving only the physical connection between the TMGB and Building Service Entrance Ground for work under Division 26 Electrical.
- E. Ground bar installation
 - 1. The C-10 Contractor shall install a ground bar in each Telecom Room to which all ground wires, grounding terminal points within the room, and Telecommunications Bonding Backbone conductors will terminate.

3.3 EXAMINATION AND ACCEPTANCE

- A. Review bonding configuration after all cabling and equipment is installed for approval by project IOR representative.

END OF SECTION

SECTION 27 05 29
HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of communications supports and cable hook system as described in this specification, including but not limited to:
1. Strut supports
 2. Cable hooks (J-hooks)
 3. Beam clamps
 4. Concrete fasteners
 5. Touch-up materials
 6. Conduit supports
 7. Equipment supports
 8. Fastening hardware
 9. Poke-through device

1.2 SYSTEM DESCRIPTION

- A. Provide devices specified in this Section and related Sections for support of communications equipment specified for this project.
- B. Provide support systems that are adequate for the weight of equipment, conduit and wiring to be supported.

1.3 SEISMIC REQUIREMENTS

- A. Seismic design requirements criteria, as shown on all drawings related to the project, including architectural and structural, as defined below shall apply to all work defined within the following specification sections:
1. SECTION 27 05 26 GROUNDING AND BONDING OF COMMUNICATIONS SYSTEMS
 2. SECTION 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
 3. All support systems and termination apparatus associated with the telecommunications system.
- B. Contractor to install seismic restraints for all telecommunications racks and UPS systems. In accordance with construction documents. Include floor mounted items weighing more than 400 pounds and wall mounted or suspended items weighing more than 20 pounds.
- C. Installation according to engineered drawings and anchorage calculations provided by the structural engineer in accordance with California Code of Regulations, Title 24, 2007 California Building Code.

- D. Supports for such items, including racks, conduit, cable trays and similar shall provide support, bracing, and anchorage, designed by the structural engineer in accordance with CBC Chapter 16A.
- E. Supports to be sized to suit load and selected to match mounting conditions

1.4 RELATED SECTIONS

- A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS
- B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
- C. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS
- D. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 2 - PRODUCTS

2.1 FASTENERS, STRAPS, AND BEAM CLAMPS

- A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:
 - 1. Concrete fasteners
 - a. Hilti
 - b. Phillips "Red-Head"
 - c. Remington
 - d. Ramset
 - e. Simpson Strong-Tie
 - f. Or approved equal.
 - 2. Concrete inserts and construction channel:
 - a. Unistrut Corp.
 - b. GS Metals "Globe Strut."
 - c. Thomas & Betts
 - d. "Kindorf" Corp.
 - e. Or approved equal.
 - 3. Conduit straps:
 - a. 0-Z/Gedney
 - b. Erico "caddy" Fastening Products
 - c. Thomas & Betts
 - d. "Kindorf" Corp.
 - e. Or approved equal.
 - 4. Beam Clamps
 - a. Cooper B-line.
 - b. SuperStrut.

- c. Unistrut.
- d. Or approved equal.

2.2 CABLE HANGERS

A. Ceiling Hung J-Hooks

1. Specifically intended to carry the load of up to 74 communications cables without applying excess forces to cables at bottom of bundle.
2. Integral broad bottom edge to spread cable load with flat bottom and provide a minimum of 1-5/8" cable bearing surface.
3. Integral hanger rod attachment hardware at top. Load rated for application.
4. Incorporates smooth 90-degree radius edges to prevent snagging cable jackets on installation.
5. Designed so the mounting hardware is recessed to prevent cable damage.
6. Integral mechanical cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable.
7. Suitable for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.
8. Multi-tiered cable hooks to be used where required to provide separate cabling compartments, or where additional capacity is needed.
9. Finishes: cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
10. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.
11. Manufacturer:
 - a. Cooper B-Line series BCH21, BCH32, BCH64.
 - b. Caddy/Erico cablecat.
 - c. or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Thoroughly examine site conditions for acceptance of supporting device installation to verify conformance with manufacturer and specification tolerances.
- B. The University's Representative reserves the right to request additional supports where in their sole opinion said supports are required. Any additional supports shall be installed at no additional cost to the University.

3.2 PREPARATION

- A. Prepare and maintain the following clearances from EMI sources (per BICSI Standards).
 1. Power cable (in grounded conduit) = 6 inches
 2. Power cable (unshielded) = 24 inches

3. Fluorescent lights = 5 inches
4. Transformers = 48 inches

- B. Provide all low voltage Communications Systems Pathways and Electronic Security and Safety System Pathways.

3.3 DISTRIBUTION PATHWAY VIA CEILING HUNG CABLE HOOKS (J-HOOKS)

- A. The cabling support system shall be installed in accordance with the manufacturer's instructions and as indicated on Contractor's submittal documentation, prior to final acceptance/approval by the University.
- B. Cable Tray cables are not to exceed a 25% fill when the project is complete. 25% fill is a visual fill of 50% of the cable tray.

3.4 CONDUIT

- A. Conduit used for pathway is to be designed with a maximum 40% visual fill.
- B. EZ path retrofit EZDR-400 or EZDR-200 will be provided on all conduits when required for compliance.

3.5 FLOOR BOXES AND POKE THROUGH DEVICES

- A. All Floor boxes shall be sized and approved by UCD IT and FD&C's furniture group.
 1. Wiremold RC9AM2TCBK flush poke -thru with accessories as required.
 2. One 1-1/4" trade standard, data
 3. One 1-1/2" trade standard, av or other
 4. Floor poke through assembly, dual service feed-through fitting. Commonly used wire mold RC9AM2TCBK flush poke -thru with accessories as required. One 3/4" trade standard and one 1-1/4" trade standard.
 5. Wiremold 4ffatcbs flush furniture feed poke -thru with accessories as required.
 6. Or approved equal.

3.6 FIRE PENETRATIONS

- A. Install UL listed fire-stop system whenever a raceway penetrates a firewall in conformance with the manufacturer's directions, the published systems assembly requirements, CBC Section 709 and 710 and CEC 300-21, whichever is the most restrictive. At cable tray penetrations, provide pillow type removable fire stop per CBC Section 709 and 710, the published systems assembly requirements and the manufacturer's directions, whichever is the most restrictive.
- B. EZ path retrofit EZDR-400 shall be provided where applicable as fire stop materials on all conduits.
- C. All communications systems cabling pathway openings in walls and floors are the responsibility of the Contractor.
- D. Install only EZ-Path products for all horizontal and vertical cabling pathway openings within TR rooms. Conduit sleeves are not acceptable.

- E. The communications conduit pathway/box system shall be installed in accordance with the manufacturer's instructions and as indicated on Contractor's submittal documentation, prior to final acceptance/approval by the University.

END OF SECTION

SECTION 27 05 33
CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide telecommunications pathways in accordance with EIA TIA/EIA-569-B, as shown on the plans or as designed by an RCDD.
- B. Provide conduits as required by fire code and where wall cavities are obstructed.
- C. Provide Ring and String where allowed in wall cavities and locations are accessible.
- D. Provide a minimum of a 1 ¼ "conduit for wall drops as needed.
- E. All junction boxes shall be sized and designed by a registered RCDD communications designer
- F. Conduit for communications is to NOT adhere to the parallel to the exterior wall configuration required by the electrical specification. Cable Distance is priority for communications cabling and dictates path taken.

1.2 RELATED SECTIONS

- A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS
- B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
- C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
- D. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

1.3 SUBMITTALS

- A. Submittals are to be approved by IT Facilities
- B. Submit conduit shop drawings for cable path other than wall drops.
- C. Confirm low voltage pathway quantity and fill ratio expected.
- D. Include junction box locations and sizes.

PART 2 - PRODUCTS

2.1 WORK AREA OUTLET BOX

- A. Work area outlet box
 - 1. 5 square deep boxes on wall drops where required

2.2 JUNCTION BOXES

- A. Junction Boxes
 - 1. Sized to accommodate bend radius of cabling being installed.

2.3 FLOOR BOXES, POKE-THROUGHS AND MONUMENTS

- A. Floor Box, Flush Devices
 - 1. All Floor boxes shall be sized and approved by IT facilities and FD&C's furniture group.
 - 2. Manufacturers
 - a. Wiremold RC9AM2TCBK Flush Poke -Thru with accessories as required.

2.4 WIRELESS, SECURITY AND OTHER PERIPHERAL CABING INSTALLATIONS

- A. Conduit and/or electrical outlet box shall not be installed for wireless access point installations unless required by AHJ or physical conditions of the area.
- B. Consider the device being installed when calling out conduit and housings for security and peripheral devices due to differing requirements.

2.5 FIRE PENETRATIONS

- A. EZ path retrofit EZDR-400 shall be provided where applicable as fire stop materials on all conduits.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Distribution Pathway via EMT Raceway:
 - 1. Structured cabling installation is to meet BICSI cable distance limitations. Remaining parallel to the building structure is not a requirement.
 - 2. All ends of conduits shall be cut square, reamed and fitted with insulated bushing.
 - 3. All conduit which passes through firewalls shall adhere to applicable fire code.

3.2 PREPARATION

- A. Fill ratios are to be calculated by the designer and installer during their respective design and installation phases of the project.
- B. Cable Tray cables are not to exceed a 25% fill when the project is complete. 25% fill is a visual fill of 50% of the cable tray.
- C. Conduit used for pathway is to be designed with a maximum 40% visual fill.
- D. EZ path retrofit EZDR-400 or EZDR-200 will be provided on all conduits when required for compliance.

3.3 MOUNTING AND INSTALLATION – WORK AREA OUTLET BOX

- A. Provide back boxes at all wall phones and employee time clocks.
- B. The distance between pull boxes shall not exceed 100 feet
- C. Conduits exceeding two 90-degree bends shall be upsized to the next trade size and never exceed 240 degrees.
- D. Support and fasten pathway and pull boxes as defined in the electrical specifications.

3.4 PENETRATIONS

- A. Provide EZ path fire penetrations where applicable.
- B. Provide conduit penetrations per electrical Specifications.

3.5 STATION CABLE PATHWAY INSTALLATION

- A. Work Area Outlet Boxes:
 - 1. Unless otherwise noted on the plans, all cut in boxes and surface station outlet boxes are to be installed at a height of 18" A.F.F. (above finished floor) to center, except for those otherwise called out.
 - 2. Those plates or boxes that are to be used for telephone wall jacks shall be installed according to ADA requirements.
 - 3. All cabling outlets shall be installed so that their edges are parallel to the vertical and horizontal edges of the surface on which they are mounted.

END OF SECTION

SECTION 31 20 00 EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rough Grading of site, Excavating, backfilling and grading, as required to obtain contours and elevations indicated on the Drawings.
 - 2. Subgrade preparation for pavement areas.
- B. Related Sections:
 - 1. Section 01 23 00 Alternates.
 - 2. Section 01 57 23 Storm Water Pollution Prevention
 - 3. Section 02 41 13 Selective Site Demolition.
 - 4. Section 31 23 33 Trenching and Backfilling.

1.2 REFERENCES

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 1997.
- B. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2000a.
- C. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2000.
- D. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2000.
- E. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994.
- F. ASTM D 2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregates; 1995.
- G. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1996.
- H. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1996.
- I. Project Geotechnical Engineering Report

1.3 DEFINITIONS

- A. Excavation: Earth excavation includes excavation of pavement and other obstructions visible on the ground surface; underground structures, utilities and other items to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
- B. Subgrade: Previously undisturbed material prepared and compacted to required density and elevation to support a structure, or pavement system.
- C. Subbase: Compacted layer of approved material used between the subgrade and the pavement.
- D. Earth Excavation: Materials not otherwise defined as rock excavation including removal and disposal of pavements, visible on grade obstructions, underground structures, utilities and other items indicated to be removed.
- E. Unauthorized Excavation: Includes removal and disposal of material beyond subgrade elevations, and dimensions indicated without prior approval of the University's Representative.
- F. Standard Specifications: Refers to the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation (Caltrans), latest edition. In case of conflict between the Standard Specifications and these Specifications, the strictest Specifications shall govern.
- G. Provisions for measurement and payment specified within the Standard Specifications shall be disregarded and the provisions of this Agreement shall govern.
- H. Relative Compaction: Ratio, expressed as a percentage of field dry density as compacted to a maximum dry density of representative sample of the same material determined by ASTM D1557.

1.4 SUBMITTALS

- A. Conform to the requirements of Section 01 33 23 Shop Drawings, Product Data and Samples for submittal procedures.
- B. Product Data: Provide data on Products specified.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Project Record Documents: Record actual locations of pipe mains, valves, connections, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- F. Deliver samples of import backfill materials to University's Representative in quantities sufficient for testing. Deliver at least 15 days prior to use.
- G. Submit a Confined Space Emergency Plan in accordance with Section 01 41 00 Regulatory Requirements prior to any personnel entering trenches or excavations greater than 5 feet in depth.

1.5 QUALITY ASSURANCE

- A. Testing and Inspection Service: University will engage soil testing and inspection service, for quality assurance testing during earthwork operations.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Stockpile satisfactory excavated materials in approved location, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
 - 1. Do not store soil within drip line of trees indicated to remain.

1.7 PROJECT CONDITIONS

- A. Subsurface Conditions: Contractor responsibility to determine the exact nature and extent of subgrade conditions.
 - 1. Subgrade and geotechnical information provided by the University shall not relieve the Contractor of responsibility for being familiar with the character and extent of subsurface conditions that may be encountered during performance of the Work.
- B. Do not use explosives.
- C. The Contractor shall assess and evaluate all site conditions and layout the work before any earthwork shall begin.

1.8 MAINTENANCE

- A. Repair settlement at excavated areas for a period of one year following final acceptance at no additional cost to University. Remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment; restore appearance, quality, and condition of surface and finish to match adjacent work, and eliminate evidence of restoration.

1.9 WARRANTY

- A. The Contractor shall warrant the Work against settlement for a period of two years after the date of final acceptance, and shall repair damage caused by settlement within that time. For the purpose of this Specification, settlement will be deemed to have occurred if on paved surfaces, depressions greater than 3/8 inch occur relative to paved surfaces outside the excavation area.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fill Materials:
 - 1. Lime-treated soil, where the upper 12 inches of the final subgrade soils is treated with at least 4.5 pounds of high-calcium or dolomitic quicklime per cubic foot of soil amended in accordance with the Geotechnical Engineering Report. Lime-stabilized soils shall be compacted to at least 92 percent relative compaction in building and structure areas, and 95 percent relative compaction in pavement areas, at a moisture content at least 2 percent over optimum conditions in accordance with the Geotechnical Engineering Report. If lime is used to finish the building pad, special cleanup will be required where the lime-treated soil extends into planting areas. All lime-treated materials must be dug out and replaced with clean topsoil fill.
 - 2. If imported material is required for fill and backfill, the imported material must be granular soil, free of organic matter, which does not exhibit excessive shrinkage or swelling behavior when subjected to changes in water content. Imported fill shall contain no environmental contaminants or construction debris. For import soil in landscape areas, refer to Section 31 22 19 Landscape Grading. The material shall conform to the following:

- a Have 100 percent pass through a 3 inch sieve, 95 to 100 percent pass through a 1 inch sieve.
- b Be thoroughly compacted without excessive voids.
- c Have a maximum Plasticity Index of 15.
- d Have an Expansion Index less than 20.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate by hand within drip-line of trees to remain. Do not damage trees or roots, prevent dehydration of exposed roots. Refer to Section 01 56 39 Tree and Plant Protection for additional requirements.
- B. Surfaces to receive fill and soils to be compacted shall be free of standing water, and shall not be saturated with water.
- C. In asphalt concrete paved areas, neatly saw cut pavement 12 inches beyond the limits of excavations. If edge of pavement is located within 30 inches of limit of excavation, remove pavement to existing edge. In concrete paved areas, saw cut at existing joints. See Section 01 73 29 Cutting and Patching.
- D. Remove existing utility lines that traverse the site as indicated on Drawings and in accordance with Section 02 42 13 Deconstruction of Structures.

3.2 SITE CLEARING

- A. Complete clearing and stripping as indicated on Drawings and in accordance with Section 02 42 13 Deconstruction of Structures.
- B. Scarify and compact the upper 12 inches of the exposed subgrade-to-receive fill to 90 percent relative compaction.

3.3 EXCAVATION

- A. Additional Excavation: When excavation has reached required subgrade elevation shown on Drawings, notify University's Representative who will inspect conditions. When unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and place excavated material as directed by the University's Representative.
- B. Stability of Excavations: Comply OSHA regulations for slope requirements. Provide shoring and bracing where required slope cannot be maintained.
- C. Excavation for Pavements: Cut surface under pavements to comply with pavement section shown on Contract Documents.
- D. Coordinate excavation, preparation and backfill with Work of related Sections for Project Site utilities, drainage and irrigation systems.
- E. Replace the excavated material or any approved supplementary import material in lifts not to exceed 6 inches in compacted thickness and compact each lift to a minimum 90 percent relative compaction.

- F. The upper 12-inches of fill within building pads and concrete flatwork areas shall be per the project geotechnical report.
- G. Perform footing excavations after fill placement is complete.

3.4 COMPACTION

- A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification as indicated below.
- B. Percentage of Maximum Density Requirements: Compact soil to no less than the following percentages of maximum density in accordance with ASTM D 1557.
 - 1. Building Slabs: Compact top 12 inches of subgrade and each layer of backfill or fill material at 90 percent relative compaction.
 - 2. Lawn or Unpaved Areas: Compact top 12 inches of subgrade and each layer of backfill or fill material at 85 percent maximum relative compaction.
 - 3. Vehicular pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material at 90 percent relative compaction. The upper 6 inches of pavement subgrade soils shall be compacted to at least 95 percent relative compaction.
- C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
 - 1. Remove and replace or scarify and air dry soil material that is too wet to permit compaction to specified density.
 - 2. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.5 BACKFILL AND FILL

- A. Place approved soil material in layers to required subgrade elevations, for each area classification listed below. Do not use water saturated soil material or contaminated material.
 - 1. In excavations, use approved excavated or borrow material.
 - 2. Under planted areas, use topsoil from site stockpile.
 - 3. Under walks and pavements, use subbase material, approved excavated or borrow material, or combination of both.
 - 4. Under steps, use approved subbase material.
 - 5. Under building slabs, use approved drainage fill material.
- B. Backfill excavation as promptly as work permits, but not until completion of the following:
 - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

2. Inspection, testing, approval, and recording locations of underground utilities.
 3. Removal of concrete formwork, shoring and bracing: Prevent settling due to removal of materials from below structures.
 4. Backfilling of voids with satisfactory materials.
 5. Removal of trash and debris from excavation.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- C. Place backfill and fill materials in uniform lifts not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches loose depth for material compacted by hand-operated tampers. Prevent wedging action of backfill against structures and displacement of piping and conduit.

3.6 GRADING

- A. Provide smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated on Drawings, or between such points and existing grades.
- B. Grade areas outside of building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, within the following tolerances above or below required finish grade.
1. Lawn and Unpaved Areas to Receive Topsoil: 0.10 foot
 2. Pavements and Walks: Line, grade and cross-section, 0.10 foot
 3. Structures: 0.10 foot.
- C. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.
- D. Grade fill under building slabs smooth and even, free of voids, to required elevation. Provide final grades with a tolerance of plus or minus 1/4 inch in 10 feet.

3.7 FIELD QUALITY CONTROL

- A. See Section 01 45 00 Quality Control, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), or AASHTO T 180.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the University.

3.8 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Stockpile enough topsoil to place 12 inches in planting areas (exclusive of decomposed granite areas), soil to be clean of debris including gravel.

- B. Comply with the applicable provisions of Section 01 74 00 Cleaning and Waste Management.
- C. Remove excess excavated material, trash, debris and waste materials and dispose of it off the University's property.
- D. Except for stripped topsoil or other material indicated to remain University property, cleared materials shall become the Contractor's property and shall be removed from the Project site.

3.9 PROTECTION

- A. Protection of Graded Areas: Protect newly graded areas from traffic, erosion, and compaction. Keep free of trash and debris.
- B. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.
- C. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- D. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.10 CONSTRUCTION WASTE MANAGEMENT

- A. Comply with the applicable provisions of Section 01 74 00 Cleaning and Waste Management including, but not limited to:
 - 1. Separate packaging materials by type and place in locations designated by the Contractor.
 - 2. Place unused scrap material in locations designated by the Contractor.

END OF SECTION 31 20 00

**SECTION 31 22 19
FINISH GRADING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Scope of Work: Provide landscape grading in landscape areas as shown and specified including: removal of rock, gravel and other construction related material, sub-grade treatment, ripping and rough grading, soil replacement, and finish grading.
- B. Related Sections:
 - 1. Section 32 84 00 Irrigation
 - 2. Section 32 90 00 Planting

1.2 SUBMITTALS

- A. Submit documentation to University's Representative at least [30] [60] [xxx] days before grading certifying that enough soil is available, listing sources of materials.
- B. Submittals shall include but not be limited to the following:
 - 1. Soil test reports of existing site soil (after rough grading) – one test per one thousand square feet of planted landscape area.
 - 2. Soil test reports of any import topsoil (one test per fifty cubic yards of import)
 - 3. Two-gallon sample from each import topsoil source. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall have soil peds (soil fragments or clods) intact that represent the size and quantity of expected peds in the final delivered soil.
- C. Quality Assurance Soil Testing - soil tests shall include the following information:
 - 1. Particle size analysis (percentage dry weight) and USDA soil texture analysis.
 - 2. pH and buffer pH
 - 3. Percent organic content by oven dried weight.
 - 4. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.
 - 5. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.
 - 6. Cation Exchange Capacity (CEC).

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Weather: Do not mix, deliver, place or grade soils with moisture above field capacity.

- B. Protect soil and soil stockpiles, including the stockpiles at the soil blender's yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.

1.4 COORDINATION AND SCHEDULING

- A. Protection of University Property: See the Division I: General Requirements section regarding special requirements.
- B. Protection of Existing Trees and Plantings: See the Division I: General Requirements section regarding tree and plant protection.
- C. Scheduling: Landscape grading operations shall be performed prior to irrigation installation or other utility infrastructure shallower than 24 inches.
- D. Observation Schedule. Contractor shall notify University's Representative in advance for the following site visits, according to the time indicated:
 - 1. Pre-landscape grading conference - 7 days.
 - 2. Pre-rip inspection - removal of construction debris and deleterious material from soil surface and any known contaminants below surface (lime-treated material, base rock etc.) - 48 hours.
 - 3. Post rip and scarification – 48 hours.
 - 4. Incorporation of approved topsoil or import topsoil - 48 hours.
 - 5. Incorporation of organic amendment or compost into top 12 inches, see also Section 329000, Planting.

1.5 SAMPLES AND TESTS

- A. University's Representative reserves the right to take and analyze samples of materials for conformity to specifications at any time. Contractor shall furnish samples upon request. Rejected materials shall be immediately removed from the site at Contractor's expense. Cost of testing of materials not meeting specifications shall be paid by Contractor.
- B. Contractor shall have soil tested by an independent soil testing laboratory.

PART 2 - PRODUCTS

2.1 IMPORT TOP SOIL

- A. Imported Topsoil definition: Fertile, friable soil containing less than 5% total volume of the combination of subsoil, refuse, roots larger than 1 inch diameter, heavy, sticky or stiff clay, stones larger than 1 inches in diameter, noxious seeds, sticks, brush, litter, or any substances deleterious to plant growth. The percent (%) of the above objects shall be controlled by source selection not by screening the soil. Topsoil shall be suitable for the germination of seeds and the support of vegetative growth. Imported Topsoil shall not contain weed seeds in quantities that cause noticeable weed infestations in the final planting beds. Imported Topsoil shall meet the following physical and chemical criteria:
 - 1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 25%. And a combined clay/silt content of no more than 55%.

2. pH value shall be between 5.5 and 7.5.
 3. Percent organic matter (OM): 2.0-5.0%, by dry weight.
 4. Soluble salt level: Less than 2 mmho/cm.
- B. The pH of saturated paste shall be between 5.5 and 7 without high qualitative lime content. The sodium absorption ratio (SAR) shall not exceed six and the electrical conductivity (ECe) of the saturation extract of this soil shall not exceed 2.0 milliohms per centimeter at 25 degrees centigrade. The boron content shall be no greater than one part per million as measured on the saturation extract.
- C. Imported Topsoil shall be a harvested soil from fields or development sites when possible. The organic content and particle size distribution shall be the result of natural soil formation. Manufactured soils where coarse sand, composted organic material or chemical additives has been added to the soil to meet the requirements of this specification section shall not be acceptable. Retained soil peds shall be the same color on the inside as is visible on the outside.
- D. Imported topsoil for planting soil shall NOT have been screened and shall retain soil peds or clods larger than two inches in diameter throughout the stockpile after harvesting.
- E. Stockpiled existing topsoil at the site meeting the above criteria may be acceptable, but must be approved by the University's Representative in writing.

PART 3 - EXECUTION

3.1 SOIL CLEANUP, REPLACEMENT AND PREPARATION

- A. Cleanup and preparation: Contractor shall review site conditions and remove all visible stones, stumps, gravel, concrete, asphalt, and other construction debris and deleterious materials including any and all germinated weeds prior to commencing finish grading work in landscape areas.
1. At the conclusion of flatwork installation but prior to the commencement of irrigation system installation, the top twelve inches of soil shall be removed from all landscape areas and disposed of off-site. This shall be considered the minimum requirement for dig-out of all landscape areas on a project unless directed otherwise by the University Representative, pending review of site soil conditions during this phase.
 2. The next lower 12 inches of soil shall be ripped and then cleared of all concrete, asphalt, and other construction debris and deleterious materials, and all stone and gravel larger than 1 inch in diameter, that are brought to the surface as a result of cultivations. However, if subsoil in this profile consists of greater than 15% rock, gravel or other debris of any size by volume it shall be removed entirely and replaced with imported top soil. Cultivation shall be by an excavator or other ripping equipment. Call Underground Service Alert (USA) before beginning cultivation operations. Subsoil shall be compacted to 85 percent relative density prior to backfilling with topsoil.
- B. Soil replacement with stockpiled or imported topsoil
1. Place a minimum of 12 inches of clean topsoil into all planting areas after the subsoil has been ripped to a depth of 24 inches from finished grade. Clean topsoil can be stockpiled on site, but must be kept clear and free of debris and rock, and then used as needed for landscaping upon written approval by the University's Representative.
 2. In areas where site soil has been compacted by construction activity, or building foundations have been over-excavated and re-compacted, additional mitigation

measures may be required to improve soil and drainage conditions for planting. These may include, but are not limited to: the installation of subsurface drainage systems for shrub and groundcover areas and individual tree pits; removal of additional soil from the planting areas beyond what is specified above until acceptable drainage and compaction levels are achieved; aeration tubes installed; radial soil trenches dug out around each tree; or other measures as determined and approved by the University's Representative. Mitigation measures shall be completed by the contractor as required at no additional cost to the University. See Planting Installation paragraph for more information and additional related requirements.

3.2 FINISH GRADING

- A. When preliminary grading has been completed and the soil is sufficiently dry to be readily worked, add soil amendments to a depth of twelve inches (see Section 329000 Planting) and grade planting areas to the elevations indicated on the Drawings' details. Minor adjustments of finish grades will be made at the direction of the University's Representative. Finish grade will be a smooth, even, and uniform plane with no abrupt change of surface. Soil areas adjacent to the building will slope away from the building to allow a natural run-off of water, and surface drainage will be directed as indicated on the Drawings by remodeling surfaces to facilitate the natural run-off of water. Low spots and pockets will be graded to drain.
- B. The finish grade of all landscape areas shall be one inch below the grade of adjacent pavement, walks, curbs, or headers extending eight to twelve inches beyond edge of paving, transitioning to three inches beyond that to allow for depth of mulch layer. An exception to the above requirements will be made wherever drainage conditions may require flush grades as directed by the University's Representative.
- C. The finish grade of all sod lawn areas will match grade of adjacent pavements walks, curbs or headers. An exception to the above requirements will be made wherever drainage conditions may require flush grades as requested by the University's Representative.
- D. Contractor shall be responsible for finish grading to ensure positive drainage and proper slope to drains. All flow lines, designated or not, are to be graded and maintained to allow free flow of surface water, and are to conform to the intent of the Drawings after thorough settlement and compaction of the soil.
- E. Dispose of any unacceptable or excess soil legally at an offsite location.

3.3 CLEAN UP

- A. During the progress of the Work, the Contractor shall keep the Project site in a neat and clean condition that is free of debris to the satisfaction of the University's Representative. All materials and debris accumulated in conjunction with completing this Work shall be legally recycled or disposed of by Contractor off campus. Refer to Section 017400 Cleaning and Waste Management. Remove all trash, excess soil, empty plant containers and rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site.
- B. The Contractor shall leave the site area broom-clean and shall wash down all walkways and other paved areas, leaving the premises in a clean and safe condition.
- C. Promptly remove soil and debris created by landscape grading work from paved areas and building walls. Clean wheels of vehicles before leaving site to avoid tracking soils onto surfaces of roads, walks, or other paved areas.

END OF SECTION 31 22 19

**SECTION 31 23 33
TRENCHING AND BACKFILLING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes trenching, backfilling and compacting for utilities.
- B. Related sections
 - 1. Section 01 45 00 Quality Control.
 - 2. Section 01 57 23 Storm Water Pollution Prevention.
 - 3. Section 31 20 00 Earth Moving.

1.2 REFERENCES

- A. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³); 2000.
- B. Manual of Warning Signs, Lights and Devices for Use in Performance of Work Upon Highways, issued by the California State Department of Transportation.
- C. Office of Safety and Health Act (OSHA) Construction Safety Orders
- D. California Code of Regulations Title 8: Construction Safety Orders.

1.3 DEFINITIONS

- A. Finish Grade Elevations: Indicated on Drawings.
- B. State Standard Specifications: State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Specifications, latest edition, excluding Sections pertaining to measurement and payment items.
- C. Relative Compaction: Ratio, expressed as a percentage of field dry density as compacted to a maximum dry density of representative sample of the same material determined by American Society for Testing and Materials (ASTM) Test Method D1557 (c).

1.4 SUBMITTALS

- A. Conform to the requirements of Section 01 33 23 Shop Drawings, Product Data and Samples for submittal procedures.
- B. Product Data: Provide data for Products specified.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Project Record Documents: Record actual locations of pipe mains, valves, connections, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

- F. Submit name of imported materials source.
- G. Deliver samples of backfill and fill materials to University's Representative in quantities sufficient for testing. Deliver at least 15 days prior to use.

1.5 WARRANTY

- A. The Contractor shall warrant against settlement for a period of two years after the date of final acceptance and shall repair damage caused by settlement within that time. For the purpose of this Specification, settlement will be deemed to have occurred if on paved surfaces, the depression falls 3/8-inches below the average of the sides of the uncut portion.

PART 2 - PRODUCTS

2.1 BEDDING AND BACKFILL MATERIALS

- A. Bedding: bank sand; washed, free of silt, clay, loam, friable or soluble materials and organic matter; graded as follows: Sand bedding shall have a minimum sand equivalent of 45 and shall be uniformly graded from No. 4 to 200 mesh screen.
- B. Backfill: Native backfill shall be selected material excavated from the trench. In all cases it shall be capable of compaction to at least the relative compaction required. In-place moisture content shall not be more than 5 percent over optimum when the material is silty or clayey and will not provide a stable subsurface.

2.2 SOURCE QUALITY CONTROL

- A. See Section 01 45 00 Quality Control for general requirements for testing and analysis of soil material.
- B. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Preparation of Work
 - 1. Underpin adjacent structures, which may be damaged by excavation Work, including utilities.
 - 2. Maintain trench crossings for vehicular and pedestrian traffic at street crossing, driveways and fire hydrants.

3.2 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.
- C. See Section 31 20 00 Earth Moving for additional requirements.

3.3 PIPE BEDDING

- A. Bedding Excavation: Excavate trenches below grade of pipe bottom to the depth indicated on drawings.

- B. Stabilization of Trench Bottom: When trench is unstable due to wet or spongy foundation, stabilize trench bottom with gravel or crushed rock. The University's Representative will determine suitability of trench bottom and amount of gravel or crushed rock needed to stabilize soft foundation. Remove and replace soft material with gravel or crushed rock when directed by University's Representative.
- C. Placement of Bedding Material: Place sufficient bedding material in trench bottom up to grade of bottom of pipe. Relative compaction of tamped material shall be not less than 90 percent relative compaction. Place and compact additional bedding material to provide uniform bearing under the full length of the pipe to a minimum width of 60 percent of its external diameter.

3.4 TRENCHING

A. Work Included

1. Perform operations necessary to excavate earth, regardless of character and subsurface conditions, from the trench or adjacent thereto, and to place trench stabilization, pipe bedding, pipe cover, trench water removal, trench backfill and base, as shown on the Drawings, as well as providing traffic control and regulation through construction areas.
2. The Contractor shall do excavation of whatever substance is encountered to the lines and grades shown on the Drawings. Materials suitable for use as backfill shall be piled in an orderly manner a sufficient distance from the edge of the trench to avoid overloading and to prevent sliding into the trench.
3. The Contractor shall do such grading or Work as is necessary to prevent surface water from entering the excavation.
4. Demolish and remove existing pavement, curb and gutter, and other Project Site facilities as shown on the Drawings allow Project operations. Existing asphalt concrete pavement to be removed shall be saw cut in longitudinal neat straight lines while maintaining the cuts vertical for the full depth of the asphalt concrete pavement. Portions of existing concrete curbs, gutters and sidewalks to be removed to permit new construction shall be cut using a concrete saw to provide neat straight lines with vertical cuts.
5. Maximum allowable open trench is 600 L.F. at any one time. Trenches outside the enclosure of the temporary construction fence are to be covered or otherwise protected at the end of each work day.
6. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
7. Do not interfere with 45 degree bearing splay of building foundations.
8. Cut trenches wide enough to allow inspection of installed utilities.
9. Hand trim excavations. Remove loose matter.
10. Remove large stones and other hard matter which could damage piping or impede consistent backfilling or compaction.
11. Remove lumped subsoil, boulders and rock up to 1/3 cu. yd. in size.
12. Remove excavated material that is unsuitable for re-use from Project Site.
13. Stockpile excavated material to be re-used in area designated on Project Site in accordance with Section 31 20 00 Earth Moving.

14. Remove excess excavated material from Project Site in accordance with provisions in Section 31 20 00 Earth Moving.

- B. Width of Trench: Except where otherwise specifically permitted by University's Representative, sides of trenches shall be vertical, shored, as required, and shall be of uniform width from top to bottom. Trenches shall be of a width as shown on the Drawings.
- C. Trench Backfill: Native backfill shall be compacted by machine in uniform layers not exceeding 0.67 foot. Backfill shall be compacted to a relative compaction of not less than 90 percent to within 1 foot of subgrade. The upper 1 foot of subgrade shall be compacted to 95 percent; 85 percent compaction will be acceptable in undeveloped areas.

3.5 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.
- D. Buried pipe shall have at least 36 inches of cover and 12 inches of clearance from other utilities.

3.6 BACKFILLING

- A. Backfill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage other Work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise on the Drawings. Make gradual grade changes. Blend slope into level areas.
- I. Reshape and re-compact fills subjected to vehicular traffic.

3.7 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 0.10 foot from required elevations.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 0.10 foot from required elevations.

3.8 FIELD QUALITY CONTROL

- A. See Section 01 45 00 Quality Control for general requirements for field inspection and testing.

- B. The University will make soils tests when advised by the Contractor that in the Contractor's opinion sufficient densities have been achieved. If the first tests in any areas fails, the Contractor shall pay for further testing in that area until specified densities are obtained. The University's Representative shall determine the number and location of tests required. Contractor shall provide a backhoe and operator upon request at no additional cost to the University.
- C. Lights, flags, and other warning and safety devices for street and highway work shall conform to the requirements set forth in the current Manual of Warning Signs, Lights and Devices for Use in Performance of Work Upon Highways, issued by the California State Department of Transportation.
- D. Preparation, excavation and trenching shall comply with California Code of Regulations Title 8: Construction Safety Orders.

3.9 CLEANING

- A. Leave unused materials in a neat, compact stockpile during progress of work.
- B. Remove unused stockpiled materials. Leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

3.10 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- A. The Contractor shall remove and dispose of all excess excavated material to a suitable site. The proper and legal disposal shall be the responsibility of the Contractor.

END OF SECTION 31 23 33

**SECTION 32 11 23
AGGREGATE BASE COURSES**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Aggregate base courses.

1.2 RELATED SECTIONS:

- A. Section 01 23 00 Alternates
- B. Section 32 12 16 Asphalt Paving.
- C. Section 32 13 13 Concrete Paving

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m<sup>3 - 2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
 - 3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft³ (2,700 kN-m/m<sup>3 - 4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - 5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).</sup></sup>
- C. Caltrans Standard Specifications:
 - 1. Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS, latest edition.

1.4 QUALITY ASSURANCE

- A. Provide source and gradation from current testing (less than four months from date submitted) in accordance with Section 01 33 23 Shop Drawings, Product Data and Samples.

- B. Furnish each aggregate material from single source throughout the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Coarse Aggregate Fill Type Class II: per Caltrans Standard Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate is dry and has been inspected and verify gradients and elevations are correct.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

- A. Spread aggregate over prepared substrate to the total compacted thickness as shown on the plans.

END OF SECTION 32 11 23

**SECTION 321313
CONCRETE PAVING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes site concrete, including but not limited to pavements, walls, footings and sub slabs.
- B. Provide all labor, materials, equipment, and services to complete the work as indicated on the drawings, and in accordance with these specifications. Work includes but is not limited to the following:
 - 1. Concrete formwork
 - 2. Concrete reinforcement
 - 3. Cast-in-place concrete items:
 - a Concrete paving, sidewalks, ramps, pads, curbs, mow bands, etc.
 - b Miscellaneous concrete.
 - c All imbeds including anchor bolts, tiedowns, hold downs with bolts, straps, and sleeves.
- C. Related Sections
 - 1. Section 01 33 23 Shop Drawings, Product Data, and Samples
 - 2. Section 01 43 39 Mock-Ups
 - 3. Section 05 12 00 Structural Steel
 - 4. Section 32 84 00 Planting Irrigation

1.2 REFERENCES

- A. Caltrans Standard Specifications - Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation (Caltrans), latest edition.
- B. ASTM - American Society for Testing and Materials
- C. ACI - American Concrete Institute, Manual of Concrete Practice.
- D. CBC – California Building Code

1.3 DEFINITIONS

- A. Percent Compaction: ASTM D1557, percentage as shown on the Drawings of the maximum in-place dry density of the same material.

1.4 SUBMITTALS

- A. Conform to the requirements of Division 1, Section 01 33 23 Shop Drawings, Product Data, and Samples.
- B. Shop Drawings Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.
- C. Concrete Design Mixes:
 - 1. The preparation of design mixes will be the responsibility of the Contractor. Mix designs may be prepared by the supplier and shall be certified by a Civil Engineer registered in California. Mix designs will be designed by the supplier and approved by the University's Representative.
 - 2. Written reports will be submitted to the University Representative of each proposed mix for review. Do not begin concrete production until mixes have been reviewed by the University's Representative.
 - 3. Adjustment of Concrete Mixes:
 - 4. Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results and other circumstances warrant; at no additional cost to the University and as accepted by the University's Representative. Provide submittals as in A above. Submit adjustment designs a minimum of 48 hours ahead of schedule for concrete production.
- D. Product Data: Manufacturers' current catalog cuts and specifications for the following:
 - 1. Expansion joint filler, sealant, backer rod and bond breaker, including manufacturer's standard color chart for sealant
 - 2. Air-entrainment.
 - 3. Curing Compound.
 - 4. Fly Ash or Slag
 - 5. MDO plywood made for forming
- E. Certificates:
 - 1. Reinforcing Steel: Certificate of compliance
 - 2. Concrete Mix Design: Ticket for each batch delivered showing the following:
 - 3. Mix identification.

4. Weight of cement, aggregate, water, and admixtures, aggregate sizes/proportion, and air entrainment.

1.5 QUALITY ASSURANCE

- A. Comply with American Society for Testing Materials (ASTM) A-615 "Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement," and "Manual of Standard Practice for Detailing Reinforced Concrete Structures," publication American Concrete Institute (ACI) 315-65 of the American Concrete Institute.
- B. Comply with all pertinent recommendations contained in ACI, "Recommended Practice of Concrete Formwork, ACI-347", and Section 2606, 1997 California Building Code (CBC).
- C. Construct forms to sizes, shapes, lines and dimensions indicated on Drawings, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in Work. Use selected materials to obtain required finish. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- D. Provide complete forms of such strength and construction as to prevent any spread, shifting, or settling when concrete is deposited, and tight enough to avoid any leakage or washing out of cement mortar.
- E. Provide at least one person who shall be present at all times during execution of this portion of the Work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct all Work performed under this Section. For finishing of exposed surfaces of the concrete, use only thoroughly trained and experienced journeymen concrete finishers.
- F. Conform to Section 90 of the Caltrans Standard Specifications.
- G. The Contractor shall contact University's Representative of any discrepancies between field conditions and plans prior to proceeding with Work. The written dimension on Drawings shall supersede the graphic presentation. Dimensions are from back of curb, center line, base lines or as noted on the plans. All field adjustments must be approved by University's Representative prior to installation.
- H. All walks and curbs shall be established in the field for review and approval prior to concrete pours. The Contractor shall layout the area or form work for review by University's Representative. If approval is not obtained, the Contractor is responsible for removal of any unauthorized field adjustments.
- I. Transitions of curves to other curves, and curves to straight line tangents, shall be smooth and continuous.
- J. Place expansion joint and score joints as shown on plan. Adjustments in the field shall be made only with the approval of University's Representative.
- K. Where new concrete paving is placed adjacent to curbs or existing concrete paving, a construction joint (cold joint) shall be provided between the new concrete paving and curbs or existing concrete paving.
- L. Sleeving shall be coordinated with concrete work. Refer to irrigation plan for sleeving location.

- M. The Contractor shall be responsible for repairing, at no additional cost to University, any disturbed existing landscape designated to remain which resulted from construction of this project.
- N. Some materials may require a several week order lead time. Contractor is responsible for determining any and all ordering lead times, and providing required materials at the project site in a timely manner. No unapproved substitutions will be allowed. Contact University's Representative immediately if a specified material is not available.
- O. Mock-up: Refer to specification Section 01 43 39 Mock-Ups for submittal requirements.
 - 1. One 4 foot square mock up for all poured in place finishes, including concrete paving and vertical walls, as shown on the drawings. Mock-ups shall also include finish, jointing, thickness, and edging.
 - 2. Mock-ups shall be reviewed and approved by the University's Representative prior to commencing full work. Approved mock-up shall serve as a standard of quality for judging the acceptance of paving on the Project and may remain as part of the work.
- P. Lines and Levels: To be established by a licensed Surveyor or registered Civil Engineer.
- Q. Mix Standards: Conform to the ACI Manual and the Portland Cement Association's "Design and Control of Concrete Mixes".
- R. Design of Concrete Mix: Employ approved commercial testing laboratory to design concrete mixes as follows:

Item	Minimum Cement Content	28-Day Minimum Strength	Maximum Slump	Maximum Aggregate Size	Maximum Water / Cement Ratio
Site Curbs and Footings	517 lb/cu. yd	3,000 PSI	4 in.	1 in	0.55
Exterior Walkways	517 lb/cu. yd	3,000 PSI	4 in.	1 in	0.45

- S. Fly Ash:
 - 1. Source Control: The following sources of ash are not to be used:
 - a. Ash from a peaking plant instead of a base loaded plant.
 - b. Ash from plants burning different coals or blends of coal.
 - c. Ash from plants burning other fuels (wood chips, tires, trash) blended with coal.
 - d. Ash from plants using oil as a supplementary fuel.
 - e. Ash from plants using precipitator additives, such as ammonia.
 - f. Ash from start-up or shut-down phases of operation.

- g Ash from plants not operating at a "steady state."
- h Ash that is handled and stored using a wet system.

- 2. Fly ash used in concrete should be as consistent and uniform as possible. Fly ash to be used in concrete should be monitored by a quality assurance/quality control (QA/QC) program that complies with the recommended procedures in ASTM C311.(6) These procedures establish standards for methods of sampling and frequency of performing tests for fineness, loss on ignition (LOI), specific gravity, and pozzolanic activity such that the consistency of a fly ash source can be certified.
- 3. Fly Ash content shall not exceed 15% of the total cementitious material by weight.

1.6 QUALIFICATION OF INSTALLER

- A. Installer shall be thoroughly trained and experienced in the skills required and shall be completely familiar with the products and their installation as specified on the Drawings and in this Section. Installer shall be present at all times during progress of Work of this Section and shall direct all Work performed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivered Mixes: Coordinate delivery so that mixes may be immediately poured upon arrival at site.
- B. Components and Accessories:
 - 1. Fittings and Reinforcements: Protect from rust, soil and oil contamination at all times. Store on pallets above ground.
 - 2. Templates: Protect from damage. Test accuracy prior to each use.

1.8 SEQUENCING AND SCHEDULING

- A. Coordination: Coordinate all items of other trades to be furnished and set in place. Coordinate proper installation of all accessories embedded in the concrete and for the provision of holes, openings, etc., necessary to the execution of the work of the trades in ample time that progress of the work is not delayed.

1.9 JOB CONDITIONS

- A. Cold-Weather Placement: comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- B. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.
- C. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray form, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.

1.10 COORDINATION

- A. Secure all pipe sleeves, anchors and bolts, including those for angle frames, inserts, ties and other materials in connection with concrete construction, in position before concrete is placed.
- B. Obtain information and instructions from other Trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be embedded in concrete so provisions for their work can be made without delaying the project.

1.11 FORM CONSTRUCTION TOLERANCES

- A. Set form to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of Work so that forms can remain in place for twenty-four hours after concrete placement.
- B. Check completed formwork for grade and alignment to following tolerances:
- C. Top of forms not more than one-eighth inch in ten feet vertical elevation.
- D. Vertical face on longitudinal axis not more than one-fourth inch in ten feet horizontal width.
- E. Circular or curved formwork shall be continuous, complete radii as indicated on Drawings. No straight segments in circular/curved formwork shall be accepted.

1.12 TESTS AND OBSERVATIONS

- A. The following tests shall be made by University's testing laboratory or by a certified Special Inspector as determined by the University. Special inspections for Concrete Construction shall be in accordance with Section 1704.4 and Table 1704.4 of the 2010 CBC and as noted below:
 1. Periodic Inspection of reinforcing steel and placement.
 2. Cement: Mill analysis and test reports by supplier certifying cement conforms to Specifications is acceptable in lieu of tests at the discretion of University's Representative.
 3. Provide free access to Work and cooperate with testing laboratory.

4. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
5. Concrete Inspections:
 - a Continuous Placement Inspection: Inspect for proper installation procedures.
 - b Periodic Curing Inspection: Inspect for specified curing temperature and procedures.
6. Strength Test Samples:
 - a Sampling Procedures: ASTM C172.
 - b Cylinder Molding and Curing Procedures: ASTM C31, cylinder specimens.
7. Concrete cylinders: Make and cure in accordance with ASTM C31.
 - a Record shall be made of the time cylinders were made and of locations of concrete from which the cylinders were taken.
 - b Three identical cylinders shall be taken from each pour of 25 cubic yards or part thereof, being placed each day.
 - c When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
 - d Make one additional cylinder during cold weather concreting, and field cure.
8. Field Testing:
 - a Slump Test Method: ASTM C143.
 - b Air Content Test Method: ASTM C173.
 - c Temperature Test Method: ASTM C1064.
 - d Measure slump and temperature for each compressive strength concrete sample.
 - e Measure air content in air entrained concrete for each compressive strength concrete sample.
9. Cylinder Compressive Strength Testing:
 - a Test Method: ASTM C39.
 - b Test Acceptance: In accordance with ACI 318.
 - c Test one cylinder at 7 days.
 - d Test two cylinders at 28 days.
10. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

11. Should tests show that concrete is below specified strength; the Contractor shall remove all such concrete. Full cost of removal of inferior concrete, its replacement with concrete of proper specified strength and testing shall be borne by the Contractor.

1.13 CODES AND STANDARDS

- A. ACI 301 "Structural Concrete for Building"
- B. ACE 305 "Recommended Practice for Hot Weather Concreting"
- C. ACI 306 "Recommended Practice for Cold Weather Concreting".
- D. ACI 308 "Curing Concrete"
- E. ACI 309 "Recommended Practice for Consolidation of Concrete"
- F. ACI 318 "Building Code Requirements for Reinforced Concrete".
- G. ACI 347 "Recommended Practice for Concrete Formwork".
- H. ACI 605 "Recommended Practice for Hot Weather Concreting".
- I. ACI 614 "Recommended Practice for Measuring, Mixing, and Placing Concrete".
- J. ASTM C31 "Practices for Making and Curing Concrete Test Specimens in the Field".
- K. ASTM C33-86 "Specifications for Concrete Aggregate".
- L. ASTM C94-89 "Specifications for Ready Mixed Concrete".
- M. ASTM C143 "Test Method for Slump Portland Cement Concrete".
- N. ASTM C150 "Portland Cement".
- O. ASTM C309 "Specifications for Liquid Membrane-forming Compounds for Curing Concrete".
- P. Western Concrete Reinforce Steel Institute (WCRSI) "Manual of Standard Practice".
- Q. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent provisions shall govern.
- R. California Building Code (CBC), latest edition.
- S. Section 90 of the Caltrans Standard Specifications.

PART 2 - PRODUCTS

2.1 CONCRETE REINFORCEMENT

- A. Reinforcing Bars: Deformed Billet Steel Bars, ASTM A-615, Grade 40 or 60, containing a minimum of 70% total recycled content, clean and free from rust, scale, or coating that will reduce bond.

- B. Smooth Dowels for Joints: ASTM A615, Grade 40 smooth, billet-steel bars, shop painted with iron-oxide zinc-chromate primer.
- C. Welded Wire Mesh: ASTM A-185 plain type and uncoated finish.

2.2 CONCRETE

A. Concrete Mix:

- 1. Ready-mixed concrete in accordance with ASTM C-94 and with aggregates comply with ASTM C-33 and Portland Cement ASTM C-150, Type II.
 - 2. All mixes shall conform to applicable building code requirements listed herein or on the Drawings. All mix designs shall be submitted to the University's Representative for approval before being used. Mix design shall show proportions of cement, fine and coarse aggregate, and water and graduation of combined aggregates. Calcium chloride shall not be added at any mix.
 - 3. Concrete shall be Class B per Caltrans Standards.
 - 4. Cement: All cement shall be Portland cement Type II, and shall be the product of one manufacturer. The temperature of cement delivered to the plant shall not exceed 150 degrees Fahrenheit.
 - 5. Aggregates
 - a Coarse aggregate shall have a minimum cleanliness value of 75.
 - b Fine aggregate shall have a minimum of sand equivalent of 75.
 - c Any suitable individual grading of coarse aggregates may be used.
 - 6. Water: All water shall be clean and free from deleterious matter.
 - 7. Admixture: No admixture of any type shall be used without prior approval of the University's Representative.
 - 8. Concrete shall be as specified: Class B
 - a 28-Day Minimum Strength: Refer to Table in Paragraph 1.5(R) above
 - b Concrete slump: Refer to Table in Paragraph 1.5(R) above
 - c Air Content: No air entrainment
- B. Fly Ash: Pozzolanic admixtures, conforming to ASTM C618, Class C, with weight loss of ignition limited to not exceed 3 percent shall be used in mix designs to replace Portland Cement up to 15% by weight, unless noted otherwise on drawings.
- 1. Reference: ACI 211.4R-93.
- C. Aggregate base for on-grade slabs:
- 1. As specified in Section 32 11 23 Aggregate Base Courses

- D. Water: Clean, potable (domestic) free from injurious amounts of salts, oils, acids, alkalis, organic materials or other deleterious matter. Available from source determined by University's Representative.
- E. Air Entrainment: ASTM C260.
- F. Admixtures: Admixtures containing chlorides are not permitted. All admixtures shall be mixed in accordance with manufacture's written recommendations.

2.3 ACCESSORIES

- A. Tie Wires: Black annealed, ASTM A-82, minimum 16 gauge.
- B. Chains, Bolsters, Bar supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.
- C. Stirrup Steel: ASTM A-82.
- D. Snap Ties: Snap-off metal of fixed length capable of leaving no metal within one and one-half (1 1/2) inches of surface nor causing fractures, spall or other defects larger than one (1) inch in diameter.
- E. Expansion Joint Materials:
 - 1. Premolded Joint Filler: ASTM D1751, non-extruding and bituminous type resilient filler, compatible with sealant, and having a "guide strip" removable depth gauge.
 - 2. Joint Sealant: ASTM C290, non-sag sealant "Dynatred" by Pecora Corporation, [214] 278-8158 or "Sonolastic Sealant Two-Part" by Sonneborn, [415] 889-9899, or equal.
 - 3. Color shall be selected by the University's Representative from the manufacturer's full color selection.
 - 4. Bond Breaker: Pressure-sensitive tape as recommended by sealant manufacturer to suit application.
 - 5. Finishing: Expansion joints shall be finished with Silica Sand 20 Mesh from Cascade Rock of Sacramento (or equal). Silica sand shall be applied liberally and adhered to sealant immediately after installation.
- F. Forms:
 - 1. Steel or wood of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal.
 - 2. Use forms that are straight and free of distortions and defects.
 - 3. Use flexible spring forms or laminated boards to form radius bends as required.

- G. Form Release Agent: Colorless non-staining, free from oils. Chemical agent shall not impair bonding of paint or other proposed coatings.
- H. Form-Facing Materials:
 - 1. All Surfaces: of sufficient strength to hold concrete properly in place and prevent leakage of water from forms.
 - 2. Exposed Surfaces: Matte finish, coated, medium density overlay plywood made for forming. No wood-textured finish will be permitted on exposed concrete unless specified as such.
- I. Wood Headers:

Wood: Construction Heart grade rough Redwood header and stake or pressure-treated rough Douglas Fir stake.

- 1. Nails: Hot-dipped galvanized.
- J. Curing Compound: ASTM C309, Type I-D, Class A.
- K. Integral Color: as required for decorative finishes to match existing paving.
- L. Truncated Domes:
 - 1. Materials: Tek-Way concrete dome tiles with integral color and spacing at 2.35 inches on center
 - 2. Color: Charcoal

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify that subgrade preparation for concrete paving has been completed prior to commencement of work.
- B. Surface Drainage:
 - 1. Report in writing conflicts discovered on the site or prior work, which would prevent positive drainage. Correct prior to performing concrete work.
 - 2. Do not permit finished paving surfaces to vary more than 1/4 in. measured with a 10 ft. metal straightedge, except at grade changes. No "birdbaths" or other surface irregularities will be permitted. Properly correct irregularities.

3.2 PREPARATION

- A. Templates: Use templates for all anchor plates, bolts, inserts and other items embedded in concrete. Accurately secure so that they will not be displaced during placing of concrete.

- B. Piping and Conduit: Do not embed piping, other than electrical conduit, in structural concrete. Locate conduit to maintain strength of structures at maximum. Verify size, length and location of electrical conduit.
- C. Exposed Tree Roots: protect per Section 01 56 39 Tree and Plant Protection
- D. Aggregate Base Course: Compact base course to thicknesses and relative compaction shown on Drawings.

3.3 CONCRETE REINFORCEMENT PLACEMENT

- A. Fabricate reinforcement in accordance with ACI-315, providing a minimum concrete cover of three inches or as specified in UBC, latest edition.
- B. Place all reinforcement in the exact position shown on the Drawings and secure in position during the placing and compacting of concrete. Wire bars together with No.16 gauge wire with ties at all intersections except where spacing is less than twelve inches in each direction, in which case tie alternate intersections.
- C. Place all sleeves, inserts, anchors and embedded items required for adjoining work or for its support prior to concreting. Fill voids in embedded items temporarily with readily removable material to prevent entry of concrete.
- D. Give all contractors and subcontractors whose work is related to concrete or supported by it, ample notice and opportunity to introduce and/or furnish embedded items before concrete placement.
- E. Verify that concrete reinforcement may be installed in strict accordance with all pertinent codes and regulations, the Shop Drawings and the original design.
- F. Verify score joints in sidewalk slabs are constructed at 5-foot maximum intervals.
- G. Bending:**
 - 1. Fabricate all reinforcement in strict accordance with the reviewed Shop Drawings.
 - 2. Do not use bars with kinks or bends not indicated on the Drawings or on the reviewed Shop Drawings.
 - 3. Do not bend or straighten steel in a manner that will injure the material.
 - 4. Bend all bars cold.
 - 5. Make all bends for other bars, including hooks, around a pin having diameter not less than six times the minimum thickness of the bar for number 8 and smaller and eight times the thickness for number 9 and larger.
- H. Before the start of concrete placement, accurately place all concrete reinforcement, positively securing and supporting by concrete blocks, metal chairs or spacer, or by metal hangers.
- I. Clearance:**
 - 1. Preserve clear space between bars of not less than one time the normal diameter of round bars.

2. In no case let the clear distance be less than 1 inch or less than 1-1/3 times the maximum size of aggregate.
 3. Provide the following minimum concrete covering of reinforcement:
 4. Concrete below ground deposited against forms: 3 inches.
 5. Concrete deposited against earth: 3 inches.
 6. Concrete elsewhere: as indicated on Drawings.
- J. Splicing:
1. Horizontal bars:
 2. Place bars in horizontal members with minimum laps at splices sufficient to develop the strength of the bars. Splice 40 bar diameters minimum.
 3. Bars may be wired together at laps.
 4. Wherever possible, stagger the splices of adjacent bars.
 5. Wire fabric: Make all splices in wire fabric at least 1-1/2 meshes wide.
 6. Other splices: Make only those other splices that are indicated on the approved Shop Drawings or specifically approved by University's Representative.
- K. Dowels/Anchor Bolts: Place all required steel dowels/anchor bolts and securely anchor them into position before the concrete is placed. Bending the dowels after placement of concrete will not be permitted.
- L. Obstruction: In the event conduits, piping, inserts, sleeves, or any other items interfere with placing reinforcement as indicated on the Drawings, or as otherwise required, immediately consult University's Representative and obtain review of new procedure before placing concrete.

3.4 CONCRETE FORMWORK CONSTRUCTION

- A. Construct support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete.
- B. Contractor assumes full responsibility in the removal of forms. The length of time forms must remain in place depends on the rate of time required for concrete to obtain a proper strength. Remove forms after the concrete is sufficiently hard to prevent damage to concrete.
- C. Circular or curved formwork shall be continuous, complete radii as indicated on Drawings. No straight segments in circular/curved formwork shall be accepted.
- D. Reuse of Forms:
 1. Do not reuse forms if there is any evidence of surface wear or defect which would impair quality of surface.
 2. Thoroughly clean and properly coat forms before reuse.

3.5 INSTALLATION

- A. Notification: Notify the University's Representative at least 48 hours before placing concrete.
- B. Placing Concrete:
 - 1. Unless otherwise indicated or required by the Drawings, concrete paving shall be placed on compacted subgrade to thicknesses indicated on the Drawings to 95 percent compaction.
 - 2. Place concrete in accordance with ACI-304 and Section 2605 of the California Building Code. Immediately after depositing, compact concrete thoroughly by mechanical vibration. No vibrating of form is allowed. Mixing shall be continuous, with no interruptions from the time the truck is filled until the time it is emptied. Concrete shall be placed within one and a half hours from the time water is first added.
 - 3. Insure anchors, seats, plates, and other items to be cast into concrete are placed, held securely and will not cause hardship in placing concrete.
 - 4. Insure reinforcement, inserts, embedded parts, etc. are not disturbed during concrete placement.
 - 5. Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur, unless otherwise indicated on the Drawings.
 - 6. Lines and Grades: Elevations requiring accurate placement shall be set by a competent instrument man, using a professional type instrument.
 - 7. For all concrete placed on soil, the subgrade shall be wet and compacted prior to placing.
 - 8. Before placing concrete mixing, conveying and finishing equipment, forms and reinforcing shall be well-cleaned. Wet form before placing concrete, unless oiled forms are used.

3.6 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, from excessively hot or cold temperatures, and from mechanical injury. Maintain concrete with minimal moisture loss at relatively constant temperature for a period necessary for hydration of cement and hardening of concrete. In hot, dry and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation – control material. Apply according to manufacturer's instruction.
- B. As soon as building flat work has hardened sufficiently to prevent injury to finish, apply an approved concrete curing agent in accordance with the manufacturer's recommendation.
- C. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than seven (7) days.
- D. Excessive cracking as determined by the University's Representative which is aesthetically unacceptable or which will result in premature disintegration of paving shall result in replacement of concrete.
- E. Removal of Forms: Remove no sooner than at seven days after each pour.

- F. Conform to all applicable requirements for curing and protection of concrete, Sections 90-7 and 90-8 of the Caltrans Standard Specifications.
- G. Spraying: Spray concrete during the curing period as frequently as drying conditions may require.
- H. Curing: Cure concrete in accordance with the ACI Manual of Concrete Practice. During curing period, maintain concrete above 70 degrees F. for at least 3 days or above 50 degrees F. for at least 5 days.
- I. Damage and Defacement: Protect all concrete work against damage and defacement during subsequent construction operations until final acceptance.

3.7 CLEANING AND PATCHING

- A. Removal: Remove all projecting fins, bolts, wire, nails, etc., not necessary for the work, or cut them back 1 in. from the surface and patch in an inconspicuous manner.
- B. Snap Ties: Immediately after removal of forms, cut off snap ties extending from the face of concrete to at least 1 in. deep in the concrete.
- C. Voids: Fill holes with a 1:3 cement/sand mortar with the same color as the adjoining concrete. Mix and place the mortar as dry as possible and finish flush with the adjacent surface.
- D. Corrective Patching: Correct all defects in concrete work. Chip all voids to a depth of at least 1 in. with the edges perpendicular to the surface and parallel to form markings. Fill all voids, surface irregularities, or honeycombing by patching or rubbing. Ensure that all concrete surfaces so repaired duplicate the appearance of the unpatched work.
- E. Finishing: Work finish surface texture as specified below.

3.8 FINISHES

- A. Light Broom Finish:
 - 1. Floating: Float surface once it has sufficiently stiffened. Check planeness of surface with a 10 ft. straightedge in all directions. Cut down high spots and fill lows. Immediately refloat to a uniform non-directional sandy texture.
 - 2. Obtain by drawing a stiff bristled broom across a floated finish.
 - 3. Direction of brooming to be perpendicular to direction of paving.
- B. Decorative Finish
 - 1. Exposed aggregate concrete:
 - a Shall consist of concrete panels with 12-inch wide smooth banded perimeter sections surrounding interior sections of exposed aggregate.
 - b Course Aggregate: Cache Creek 3/8 inch x number 8 pea gravel
 - c Match existing. Match shall be as determined by University's Representative.

3.9 JOINTS

A. Construction Joints:

1. Locate and install joints as indicated on the Drawings so they do not impair strength or appearance of slab.
2. All joints and other edges shall be formed in the fresh concrete using an edging tool to provide a smooth uniform impression.

B. Score Joints:

1. Locate and install joints as indicated on the Drawings so they do not impair strength or appearance of slab.
2. Score joints shall be formed in the fresh concrete using a jointer to cut the groove so that a smooth uniform impression is obtained. All joints shall be struck before and after sandblast.
3. Locate and form joints with 1/4 inch radius edges and 1 inch to 1-1/4 inch deep score at the location as shown on the Drawings.
4. All joints and other edges shall be formed in the fresh concrete using an edging tool to provide a smooth uniform impression.

C. Expansion Joints:

1. Locate and install joints as indicated on the Drawings so they do not impair strength or appearance of slab.
2. Expansion joints shall be provided at the location and 40-foot maximum intervals as shown on the plans, and at all locations where concrete paving abuts buildings, curbs or other proposed or existing structures. Install as per detail on the Drawings.
3. All joints and other edges shall be formed in the fresh concrete using an edging tool to provide a smooth uniform impression.
4. Install backer-rod and joint sealant as indicated on the Drawings.
5. Sealing of Expansion Joints: After the curing period, strip out all depth gauge strips and carefully clean expansion joints. Fill with joint compound as shown on Drawings. Avoid spilling compound on paved surfaces or overflowing from joint.
6. Protect expansion joints from damage until placement of filler or caulk.

3.10 FIELD QUALITY CONTROL

- A. Samples: Contractor shall coordinate with the University to select a qualified testing laboratory to take samples for testing during the course of the work as described in Article 1.13 Tests and Observations.
- B. Field inspection and testing will be performed by a qualified testing laboratory in accordance with ACI 318 and as described in Article 1.13 Tests and Observations.

- C. Cost of Testing: Contractor shall be responsible for costs associated with testing.
- D. Rejected Materials: Remove off the site all concrete below specified strength.
- E. Cost of Removal and Retesting: Contractor shall be responsible for costs associated with removal and costs associated with retesting.
- F. Integral color: Color shall be evenly saturated in concrete mix to provide consistent, even, and distinct color in finished installation, including after medium sandblast finish is applied.
- G. Defective Work: Remove in its entirety and replace all defective concrete work which after corrective patching, rubbing, etc., fails to duplicate the appearance of unpatched work and/or conform to the standards set forth in these Specifications.
- H. Observe formwork continuously while concrete is being placed to see that there are no deviations from desired elevation, alignment, plumbness or camber.
- I. If during construction any weakness develops and falsework shows undue settlement or discoloration, stop work, remove affected construction if permanently damaged, and strengthen falsework.

END OF SECTION 321313

**SECTION 323300
SITE FURNISHINGS**

PART I - GENERAL

1.01 DESCRIPTION

Work includes but is not limited to the following:

- A. Provide bicycle racks as indicated on the project plans.
- B. Although such Work is not specifically indicated, provide all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.02 REFERENCES

- A. Chain Link Fence Manufacturer's Institute (CLFMI): Standards.
 - 1. AISC Steel Construction Manual (14th Edition).
- B. ASTM International:
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 4. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - 5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 6. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 7. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 8. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 - 9. ASTM A588 - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4-in. (100-mm) Thick.
 - 10. ASTM A618 - Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
 - 11. ASTM A992 - Standard Specification for Structural Steel Shapes.
 - 12. ASTM F436 - Standard Specification for Hardened Steel Washers.

13. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

1.03 QUALIFICATION OF INSTALLER

- A. Chain Link Fence Manufacturer's Institute (CLFMI): Standards.
 1. Installer shall be thoroughly trained and experienced in the skills required, and shall be completely familiar with the products and their installation as specified on the Drawings and in this Section. Installer shall be present at all times during progress of Work of this Section and shall direct all Work performed.

1.04 SUBMITTALS

- A. Submit manufacturer's catalog cuts of all products for approval by University's Representative per section 01 33 23 Shop Drawings, Product Data, and Samples. Catalog cuts shall clearly identify product, finishes, color, schedule and installation.
- B. Submit aforementioned information all items, whether in contract or not in contract (OFOI). Selection, verification, and approval of all items and options is imperative to fully coordinating the work. Clearly designate any not-in-contract items (OFOI).
- C. All approvals must be granted prior to ordering product.

PART II - PRODUCTS

2.01 BICYCLE RACKS

- A. Existing Racks to be relocated per plan.

2.02 SITE BENCHES

- A. 39 Series Bench by DuMor, Inc. or equal.
- B. Steel members finish: Polyester powder coating
- C. Wood Options: IPE S4S EE

2.03 WASTE RECEPTICALS

- A. S-42 Ironsites Series by Victor Stanely, Inc. or equal.
 1. Finish: Bronze Powder Coating
- B. Standard S-2 Dome Top Lid Decal by Victor Stanely, Inc. or equal.

PART III - EXECUTION

3.01 INSTALLATION – IN CONTRACT TERMS

- A. Install as detailed on drawings and in conformance with the manufacturer's specifications.
- B. Install items level and plumb.
- C. Directly embed anchors (if equipped) into concrete footing as detailed on the Drawings and in conformance with manufacturer's specifications.

3.02 INSTALLATION – NOT IN CONTRACT (OFOI)

- A. Prepare other work to receive not in contract (OFOI) furnishings, including all footings, piping, plumbing, etc.
- B. Install items level and plumb.
- C. Directly embed anchors (if equipped) into concrete footing as detailed on the Drawings and in conformance with manufacturer's specifications.

END OF SECTION 323300

**SECTION 328400
PLANTING IRRIGATION**

PART I - GENERAL

1.01 SUMMARY DESCRIPTION

A. Scope of Work

1. Provide irrigation systems as shown on the Drawings and described herein.

B. Related Work

2. Division 26 - Electrical: Power connection for controller

1.02 SUBMITTALS

A. Material List

1. Complete manufacturer's technical data and installation instructions shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.

B. Record Drawings

1. The original record drawings shall be submitted to the University's Representative for approval prior to making the controller chart. Refer to Section 01 78 39 Project Record Documents.
2. Drawings shall include dimensions from two permanent points of reference such as building corners, sidewalks, or road intersections for the location of the following items:
 - a. Connection to existing water lines.
 - b. Connection to existing electrical power and splice locations.
 - c. Relocated existing equipment.
 - d. Gate valves.
 - e. Routing of sprinkler pressure lines.
 - f. Sprinkler locations
 - g. Sprinkler control valves.
 - h. Routing of control wiring.
 - i. Quick coupling valves.
 - j. Other related equipment as directed by the University's Representative.

C. CONTROLLER CHARTS

1. Controller charts shall be prepared by Contractor.
2. Provide one controller chart for each controller supplied.
3. The chart shall show the area controlled by the automatic controller and shall be the maximum size which the controller door will allow when rolled up.
4. The chart shall be a reduced drawing of the actual as-built system and shall be readable when reduced.
5. The chart shall be a black line print and different colors shall be used to indicate the area of coverage for each station.
6. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 10 mils if required by University's Representative.
7. As-built record drawings and controller charts shall be completed and approved prior to final inspection of the irrigation system.

D. Operation and Maintenance Manuals

1. Contractor shall prepare Operation and Maintenance Manuals in accordance with Section 01 78 00 Close-out Submittals.
 - a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representative.
 - b. Catalog and parts sheets on all major material and equipment items installed under this contract (not necessary for campus standard irrigation equipment).
 - c. Guarantee statement.
 - d. Complete operating and maintenance instructions on all major equipment.

E. Equipment to be Furnished

1. Furnish the following tools:
 - a. Two sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve provided on this project.
 - b. Two keys for each automatic controller.
 - c. Two quick coupler keys and matching hose swivel per project.

2. This equipment shall be furnished to University before final inspection can occur. Evidence that the University has received material must be provided to University's Representative.

1.03 QUALITY ASSURANCE

- A. Manufacturer's directions and detailed drawings shall be followed in all cases where points are not shown in the Drawings and Specifications.
- B. Drawings are generally diagrammatic and indicative of the work to be installed and do not show all offsets, fittings, sleeves, and other parts which may be required. Contractor shall carefully investigate the structural and finished conditions affecting all work and plan accordingly, furnishing such fittings, and other appurtenances as may be required to meet such conditions. The Work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.
- C. Before commencing irrigation system installation, Contractor shall resolve obstructions, grade differences or discrepancies in area dimensions that might not have been considered in engineering and shown on the Drawings.

1.04 COORDINATION AND SCHEDULING

- A. Contractor shall notify University's Representative in advance for the following observation meetings, according to the time indicated, and shall provide documentation to University's Representative that the following meetings occurred and their outcome.
 1. Pre-job conference - 7 days.
 2. Sleeve inspection – 48 hours.
 3. Pressure supply line installation and testing - 48 hours.
 4. Automatic controller installation - 48 hours.
 5. Control wire installation - 48 hours.
 6. Lateral line and sprinkler installation - 48 hours.
 7. Flushing of lines – 48 hours.
 8. Coverage test (prior to any planting installation) - 48 hours.
 9. Final inspection - 7 days.

PART II - PRODUCTS

2.01 PIPING MATERIALS

- A. PVC Pressure Main Line Pipe and Fittings
 1. Pressure main line piping for sizes 4 inches and larger shall be C-900 with mechanical joints.

2. Pressure main line piping smaller than 4 inches inside sleeves, shall be PVC Schedule 40.
3. Pressure main line piping for sizes 3 inches and smaller shall be PVC Schedule 40 with solvent welded joints and with Schedule 80 fittings.
4. Pipe shall be made from NSF approved Type I, Grade I PVC compound conforming to ASTM resin specification D1785. All pipe shall meet requirements as set forth in Federal Specification PS-21-70.
5. PVC solvent-weld fittings shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
6. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be Christy's Red Hot Blue Glue, or equal.
7. All PVC pipe must bear the following markings and shall be visible upon installation.
 - a. Manufacturer's name.
 - b. Nominal pipe size.
 - c. Schedule or class.
 - d. Pressure rating in PSI.
 - e. NSF (National Sanitation Foundation) approval.
 - f. Date of extrusion.

B. PVC Non-Pressure Lateral Line Piping

1. Non-pressure buried lateral line piping shall be PVC schedule 40 with solvent-welded joints.
2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D1784. All pipe shall meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
3. Except as noted above, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line pipe and fittings as set forth in these specifications.
4. For all sprinkler head installations use schedule 80 thread nipples and risers, and schedule 40 fittings.

C. PVC Sleeves:

1. PVC sleeves shall be Schedule 40 with solvent weld joints. Install sleeves at 24 inches depth for streets, 18" depth for sidewalks, to top of pipe. Backfill sleeve trench with sand. Depth exception may be considered at concrete walks with prior approval by University's Representative.

D. Brass Pipe and Fittings

1. Where indicated on the Drawings, use red brass threaded pipe.
2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.

2.02 VALVES

A. Gate Valves

1. Gate valves 3 inches and larger shall be 125 lb. Static Water Pressure (SWP) bronze gate valve with screw-in bonnet, non-rising stem, solid wedge disc, threaded ends and a bronze or malleable iron handwheel. With a 2" operating nut.
2. Gate valves 2-1/2 inches and smaller shall be brass, manufactured by Nibco, Aqua, Matco, or equal, 200 psi Water Oil Gas (WOG), 125 SWP, Screw-in bonnet, solid wedge.

B. Quick Coupling Valves

1. Quick coupling valves shall have a brass two-piece body designed for working pressure of 125 PSI operable with quick coupler.
2. Key size and type shall be as shown on Drawings.
3. Quick coupling valves shall be manufactured by Hunter (HQ44 – AW), Rainbird (44-LRC), Buckner (QB44) or equal.
4. All quick coupling valves without integral stabilizers shall be equipped with cast ductile iron anti-rotation devices or anchors that attached to the base of the valve and can be secured by a single bolt, and shall be manufactured by Leemco (LS-120, LS-150), Harco (82201, 82202) or equal.

C. Electrical Remote Control Valves

1. Electric control valves shall have a manual flow adjustment.
2. Provide one control valve box for each electric control valve.
3. Electric Remote Control Valves shall be manufactured by Hunter (ICV Series), Irritrol (Century Series), or equal.
4. Pressure regulating modules as required for pressure reduction on new or existing valves manufactured by, Hunter (Accu-Sync), Irritrol (Omni Reg), or equal, as noted on Drawings.
5. For pipe connections to valve bodies use Teflon tape material. Pipe dope shall not be used.

D. Associated Equipment

1. Wye-Strainer at POC shall be brass 80 mesh with brass gate valve to blow-out screen.

2. Above ground Wye-strainers shall be metal.
3. Wye-strainer shall be same size as water supply.
4. Gate valves 3 inches and smaller shall be brass.

E. Wye-Filters

1. Wye filter with stainless steel screen, minimum 120 mesh, size to match valve. Rain Bird LCRBY-S, Hunter HY or equal.
2. All new systems with rotating stream nozzles and all existing stations being converted from a standard spray or rotor system to a system with rotating stream nozzles (MP rotator or equal) shall include and/or be retrofitted with a Wye-filter as noted above.

F. Hydrometer

1. Hydrometer shall be compatible with the campus Rain Master central control system and must operate with controller - Netafim LHMxxTG1-MEL, normally open, with reed switch register. Install in concrete box with fiber lid after brass gate valve and Y-strainer at point of water connection. The hydrometer shall be sized to accommodate project flow rates and have the capacity to have additional systems added on in the future

2.03 BACKFLOW PREVENTION UNITS

- A. Backflow prevention units shall be of size and type indicated on the Irrigation Drawings. Install backflow prevention units in accordance with irrigation details.
- B. Backflow prevention devices shall only be used on University domestic water lines. These devices shall not be installed on utility water lines.

2.04 WIRING

- A. Irrigation Control Wiring: Copper direct burial sprinkler wire, sized according to length of the run, minimum 14 gauge (white common, red primary lead, blue for spares). Run extra wires for future valves at the ends of all main line runs (see Drawings – 4 wires minimum).
- B. Electrical Dry Connection. Spears DS -400, pre-filled dri-splice connector with crimp sleeves; DRYCONN #10222 waterproof connectors by King Innovations (#22 to #12 AWG), or equal. Waterproof under-ground wire connections.
- C. Communication Cable: All communication wire for controllers and sensors shall be installed in electrical conduit not less than 1 inch.

2.05 AUTOMATIC CONTROLLERS

- A. See landscape irrigation sheet.

2.06 MAIN LINE SHUT OFF BOX

- A. Install main line shut off valve at point of connection in a Christy concrete G5 traffic box for Main Line Shut Off Valves with “water” labeled lid, or equal.

2.07 CONTROL VALVE BOXES

- A. Use 10 by 10-1/4 inch round box for all gate valves, Carson Industries #910-12B with green bolt down cover, or equal. Extension sleeve shall be PVC- 6 inch minimum size.
- B. Use 9 1/2 by 16 by 11 inch rectangular box for all electrical control valves, Carson Industries 1419- 13B with green bolt down cover, or equal.

2.08 SPRINKLER HEADS

- A. All sprinkler heads on any one system (zone) shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the Drawings and specified.
- B. Large rotors shall be pop-ups with stainless steel risers and check valves, have a screw adjustment and shall be manufactured by Hunter (I40-06-SS), Rainbird (8005-SS), or equal.
- C. Medium rotors shall be pop-ups with stainless steel risers and internal check valves, have a screw adjustment and shall be manufactured by Hunter (I-20-06-SS, I-20-12), or equal. Size per Drawings.
- D. Spray heads shall be manufactured by Hunter (PROS--06/12-CV-PRS30 with standard MPR nozzles unless otherwise noted), Rainbird (1812/1806/-PRS-SAM with standard MPR nozzles unless otherwise noted), or equal. Variable arc nozzles are to be used only when specifically approved by the University's Representative.
- E. Low precipitation rate, multi-stream nozzles shall be Hunter MP Rotator series, or equal, and shall be used with 40 psi pressure regulating heads (Hunter PROS-06/12-PRS40-CV- MP1000/2000/3000/3500, and SR800.) or equal.
- F. Double Swing Joint Assembly: These shall be fabricated in accordance with the detail. Use Schedule 80 PVC threaded nipples and risers and Schedule 40 fittings. See detail.
- G. Bubbler heads shall be Rainbird 1300A-F with screens, or Hunter AFB, or equal.
- H.
- I. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.

2.09 LINE SOURCE SUB SURFACE DRIP IRRIGATION SYSTEMS

- A. Sub-surface drip tubing with 17mm fittings, type noted on Drawings.
 - 1. Sub-surface drip tubing with in-line, pressure compensating emitters. Emitter and row spacing per Drawings. Hunter PLD, Rainbird XFS, or equal.
 - 2. Sub-surface drip tubing with in-line, pressure compensating emitters, factory wrapped with polypropylene fleece. Emitter and row spacing per Drawings. Hunter PLD-ESD, or equal.
- B. Drip Zone Valve Assembly: Valve kit including filter (minimum 120 mesh screen) and pressure regulator, Hunter ICZ or equal.

- C. Flush valve with identification tag, compression tee, min. 24" coil of blank tubing, and flush cap. Install in 10" valve box at furthest point from remote control valve.
- D. Air/Vacuum relief valve installed at highest point of each station with compression tee, and flush cap, in a 6" or 8" valve box - Rainbird ARV, or equal.
- E. Drip indicator installed for each station, minimum 3' from paved surfaces, Hunter Eco-ID or equal.

2.10 DEEP ROOT WATERING TUBES

- A. Deep Watering Tube: 3" or 4" diameter semi-rigid polyethylene mesh tube (10 inch, 18 inch, 24 inch or 36 inch) with adjustable bubbler. Construct assembly as shown in details or use Hunter RZWS or equal, size per Drawings.

2.11 REMOTE CONTROL VALVE IDENTIFICATION TAGS

- A. 2-1/4 by 2-3/4 inch yellow polyurethane with valve number embossed on tag, as manufactured by Christy's Irrigation I.D. Tags, (714) 771-4142, or equal.

PART III - EXECUTION

3.01 INSPECTION

- A. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by Contractor's operations or neglect. Check existing Utilities Drawings for existing utility locations.
- B. Refer to 1.4 Coordination and Scheduling for additional inspection requirements.

3.02 PREPARATION

- A. Physical Layout
 - 1. Prior to installation, Contractor shall paint or flag out all pressure supply lines, routing and location of sprinkler heads.
 - 2. All piping and tubing layout shall be approved by University's Representative prior to installation.
- B. Water Supply
 - 1. Point of Connection (POC): Install hydrometer and wye strainer /after brass gate valve. The hydrometer and wye strainer to be main line-sized or larger for project and have the capacity to have additional systems added on in the future.

3.03 INSTALLATION

- A. Trenching
 - 1. Provide a minimum cover of 18 inches for all pressure supply lines.
 - 2. Provide a minimum cover of 12 inches for all non-pressure pvc lines.

3. Provide a minimum cover of 4" for all drip tubing.
4. Provide a minimum cover of 18 inches for all control wiring.

B. Backfilling

1. No backfilling shall occur until University's Representative visually inspects and approves piping layout in trenches.
2. A fine granular material backfill shall be initially placed on all lines. No foreign matter larger than 1/2 inch in size will be permitted in the initial backfill. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from 4 inch or greater clods of earth or 1/2 inch or greater stones, gravel or other debris. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill shall conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.
3. Flooding of trenches will be permitted only with approval of the University's Representative.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments at no additional cost to the University.

C. Trenching and Backfill Under Paving

1. Trenches located under areas where paving (asphaltic concrete or concrete), will be installed shall be backfilled with sand (a layer 6 inches below the pipe and 3 inches above the pipe) and compacted in layers to 95 percent compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm condition, not prone to settling. All trenches shall be left flush with the adjoining grade. The Contractor shall set in place, as part of the sprinkler Work, cap and pressure test all piping under paving prior to the paving Work.
2. Piping under existing walks shall be done by jacking, boring or hydraulic driving where possible. Where any cutting or breaking of sidewalks or concrete is necessary permission shall be obtained from the University's Representative. No hydraulic driving will be permitted under concrete paving. Concrete paving shall be replaced back to nearest control joint. See Section 01 73 20 Cutting and Patching.
3. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphalt or concrete paving.

D. Pipe Assemblies

1. PVC pipe, drip tube, and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.

2. On PVC to metal connections, Contractor shall work the metal connections first. Pipe tape shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters or machined PVC schedule 80 pipe nipples into which the pipe may be welded.
 3. Do not install multiple assemblies in plastic sleeves.
 4. Use fittings to change pipe directions. Do not deflect pipe beyond manufacturer's recommendations.
 5. Do not install joints in sleeves or under pavement if length is less than 20 feet. Where pipe length exceeds 20 feet, use minimum number of joints.
 6. Install PVC piping and fittings without tension on the fittings. Pipes should be inserted squarely and fully into socket of the fittings.
- E. Pipe Clearance: All pipes shall have a minimum clearance of 6 inches from each other and from lines of other Work. Parallel pipes shall not be installed directly over one another. No more than two pipes may be installed in a single trench.
- F. High Voltage Wiring for Automatic Controller
1. Provide 120 volt power connection to the automatic controller.
 2. Electrical connections for automatic controller shall be made to electrical points of connection
 3. Electrical connection shall be on separate circuit breaker.
- G. Remote Control Valves
1. Install where shown on Drawings and details. When grouped together, allow at least 12 inches between valve box edges. Install each remote control valve in a separate valve box.
 2. Each controller and station number shall be labeled at the valve with a 2-1/4 by 2- 3/4 inch yellow polyurethane I.D. tag attached to the control wire of the valve.
 3. Set valve boxes perpendicular to adjacent walls and parallel to one another.
 4. Thoroughly flush mainline before installing valves.
 5. Install valve and box to maintain a minimum of 1 inch clear space between the top of the valve and the lid of the box.
 6. Install valve box at the same level as soil grade, not above.
- H. Control Wiring
1. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
 2. Where more than 1 wire is placed in a trench, the wiring shall be taped together at intervals of 10 feet.

3. An expansion curl shall be provided within 3 feet of each wire connection. Expansion curl at electric control valves shall be of sufficient length so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.
4. All splices shall be made with electric dry connections. Use one splice per connector.
5. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of University's Representative.

I. Flushing of System

1. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.
2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the University's Representative.
3. Flush drip systems before installation of flush and air relief valves, keep ends open.
4. Contractor shall flush all existing and new sprinkler heads on existing stations that have been turned off or altered.

3.04 EXISTING TREES

- A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall first discuss with the University Representative and get written permission for proposed

trench route. Contractor shall use all possible care to avoid injury to trees and tree roots. Refer to Section 01 56 39 Tree & Plant Protection.

3.05 FIELD QUALITY CONTROL

A. Testing of Irrigation System

1. Contractor shall request the presence of the University's Representative in writing at least 48 hours in advance of testing. Testing of pressure mainlines shall occur prior to installation of electric control valves.
2. Test all pressure lines under hydrostatic pressure of 150 pounds per square inch, and prove watertight.
3. Sustain pressure in lines for not less than 2 hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.
4. All hydrostatic tests shall be made in the presence of University's Representative. No pipe shall be backfilled until it has been inspected, tested and approved in writing, including laterals.
5. Furnish necessary force pump and all other test equipment.
6. When the sprinkler or drip irrigation system is completed, perform a coverage test in the presence of the University's Representative, to determine if the water coverage for planting areas is complete and adequate. This test shall be accomplished before any plants are planted. This requirement applies to both temporary and permanent irrigation system installations.

B. ADJUSTMENT TO THE SYSTEM

1. Contractor shall adjust all existing and new sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible. This includes sprinkler heads on existing systems that have been turned off or altered.
2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage Contractor shall make such adjustments prior to

planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.

3. All sprinkler heads shall be set perpendicular to finished grades unless otherwise shown on the Drawings
4. Individual stations shall be completely installed and operable by controller for a period of 2 days prior to any planting. The University's Representative reserves the right to waive or shorten the operation period.

3.06 CLEAN-UP

- A. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down.

3.07 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. Contractor shall operate each system in its entirety for the University's Representative at time of final observation. All items must meet Specifications in order to be approved and accepted.
- B. The controller must be set up and under full automatic operation before final inspection can occur and maintenance period can begin.
- C. Controller charts and final as-built record drawings shall be submitted in both electronic form and as 1 full-size hard copy. Both must be provided to the University's Representative and approved before final inspection can occur and maintenance period can begin. Refer to 1.2. B. and C.
- D. Contractor shall show evidence to the University's Representative that the University has received all accessories, charts, record drawings, and equipment as required before final inspection can occur.

END OF SECTION 328400

**SECTION 329000
PLANTING**

PART I - GENERAL

1.01 SUMMARY

- A. Scope of Work: Provide landscape planting, complete in place, as shown and specified including; soil amendment and preparation, finish grading, planting, seeding, staking, header installation, decomposed granite installation, clean-up, and maintenance.
- B. Related Sections:
 - 1. Section 31 22 19 Landscape Grading
 - 2. Section 32 84 00 Planting Irrigation

1.02 SUBMITTALS

- A. Submit documentation to University's Representative at least [30] [60] [xxx] days before planting certifying that all plant material is available, listing sources of materials.
- B. Submittals shall include but not be limited to the following:
 - 1. Fertilizer: Chemical and percentage composition.
 - 2. Mulch: Size, type of material.
 - 3. Amendments: Type, size and composition.
 - 4. Seed: Botanical and common name, percentage by weight, percentages of purity, germination and weed seed for each grass seed species.
 - 5. Planting schedule indicating anticipated dates for planting.
 - 6. Proposed maintenance work schedule.
- C. Quality Assurance Submittals:
 - 1. Plants shall be subject to inspection and approval by University's Representative at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. The health and vigor of the plant material is the sole responsibility of Contractor. Submit written request for inspection of plant material at place of growth to University's Representative stating location and quantity of plants to be inspected.
- D. Plant substitutions requests shall be accompanied by a list of nurseries contacted in the search for the required plant. Requests shall also include sources of plants found that may be of smaller or larger size than specified or different cultivars. No substitutions may be made without approval of the University's Representative.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Deliver fertilizer to site in unopened containers bearing manufacturer's guaranteed chemical analysis.
2. Furnish University's Representative with copies of receipts for all amendments.
3. Deliver all plants with legible identification labels.
 - a. Label trees, shrubs, bundles of plants, or groundcover plants.
 - b. State correct plant name and size indicated on plant list.
 - c. Use durable waterproof labels with water-resistant ink which will remain legible for at least 60 days.
4. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.
5. Notify University's Representative 7 days in advance of delivery of all plant materials and submit an itemized list of the plants in each delivery.
6. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
7. Ship and store seed, mulch and fertilizer with protection from weather or other conditions that would damage or impair the effectiveness of the product.

B. Storage

1. Store plant material in shade and protect from weather.
2. Maintain and protect plant material not to be planted within 4 hours in a healthy, vigorous condition.

- C. Contractor is cautioned to exercise care in handling, loading, unloading and storing of plant materials. Plant materials that have been damaged in any way shall be discarded and shall be replaced with undamaged materials at the Contractor's expense.

1.04 COORDINATION AND SCHEDULING

- A. Perform planting only when weather and soil conditions are suitable in accordance with standards of industry.
- B. Scheduling: Install trees, shrubs, and liner stock plant material before wood mulch is spread.
- C. Observation Schedule. Contractor shall notify University's Representative in advance for the following site visits, according to the time indicated:
 1. Plant material review at growing site - notify University's Representative at least 30 days before planting.
 2. Pre-job conference - 7 days.
 3. Final grade review - 48 hours.

4. Soil preparation.
5. Plant material review - 48 hours.
6. Planting operation and plant layout review - 48 hours. One tree with each type of specified staking shall be approved prior to planting of trees - 48 hours.
7. Pre-maintenance - 7 days.
8. Final acceptance - 7 days.

PART II - PRODUCTS

2.01 GENERAL

- A. The following organic, soil amendments and fertilizer are based on typical campus soil composition and establish minimum requirements. Specific amendments and fertilizer amounts will be determined after rough grading operations are complete and soil samples are tested by the Contractor and approved by the University's Representative. The amounts listed in the Preparation section are considered minimum amounts for the project unless directed otherwise by the University Representative.
- B. All materials shall be of, approved and first-grade quality when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer's guaranteed analysis. Contractor shall supply University's Representative with a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance or bearing the manufacturer's guaranteed analysis.

2.02 HERBACIDES

- A. Non-selective, systemic contact herbicide install per manufacturer's specifications, Roundup, or equal.
- B. Pre-emergent herbicide (liquid or pelletized) install per manufacturer's specifications, Dimension or equal.

2.03 ORGANIC AMENDMENTS

- A. Organic amendment shall be nitrogen stabilized wood residual containing 0.56 to 0.84 percent N based on dry weight.
- B. Particle Size:
 1. 95 - 100 percent passing 6.35 mm standard sieve
 2. 80 - 100 percent passing 2.33 mm standard sieve
- C. Iron Content: Minimum 0.08 percent dilute acid soluble Fe on dry weight basis.
- D. Ash: 0-6.0 percent (dry weight).

2.04 COMPOST

- A. Blended and ground leaf, wood and other plant based material, composted for a minimum of 9 months and at temperatures sufficient to break down all woody fibers, seeds and leaf structures, free of toxic material.
- B. Compost shall be commercially prepared and meet US Compost Council STA/TMECC criteria.
- C. Shall comply with the following parameters:
 - 1. pH: 5.5 – 7.5
 - 2. Soil Salt (electrical conductivity): maximum 3 dS/m (mmhos/cm).
 - 3. Moisture content%, wet weight basis: 30-60.
 - 4. Particle size, dry weight basis: 98percent pass through 3/4 inch screen or smear.
 - 5. Stability carbon dioxide evolution rate: mg CO₂ –C/g OM/day<2.
 - 6. Solvita maturity test:> 6
 - 7. Physical contaminants, percent dry weight: <1percent.
 - 8. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40 CFR & 503.13, Tables 1 and 3 levels.
 - 9. Biological contaminants meet or exceed US EPA Class A standard 40 CFR & 503.32 (a) level requirements.

2.05 SOIL AMENDMENTS

- A. Soil Sulfur: Agricultural grade sulfur containing a minimum of 99 percent sulfur (expressed as elemental).
- B. Iron Sulfate: 20 percent Iron (expressed as metallic iron), derived from ferric and ferrous sulphate, 10 percent sulfur (expressed as elemental).
- C. Gypsum: Agricultural grade product containing 98 percent minimum calcium sulphate.

2.06 FERTILIZER

- A. Planting Fertilizer: Pelleted or granular form shall consist of the following percents by weight and shall be mixed by commercial fertilizer supplier:
 - 1. 16 percent nitrogen
 - 2. 6 percent phosphoric acid
 - 3. 8 percent potash
- B. Planting Tablets
 - 1. Shall be slow-released type with potential acidity of not more than 5 percent by weight containing the following percentages of nutrients by weight:

- a. 20 percent nitrogen
 - b. 10 percent phosphoric acid
 - c. 5 percent potash
 - d. 2.6 percent combined calcium
 - e. 1.6 percent combined sulfur
 - f. 0.35 percent iron (elemental) from ferrous sulfate
2. Shall be 21 gram tablets as manufactured by Agriform, Best Tabs, or equal, applied per manufacturer's instructions.
- C. Sulphate of Potash: 0-0-50.
- D. Single Super-phosphate: Commercial product containing 18-20 percent available phosphoric pentoxide
- E. Urea Formaldehyde: 38-0-0.
- 2.07 IMPORT TOP SOIL
- A. See Section 312219, Landscape Grading.
- 2.08 PLANT MATERIAL
- A. Plants shall be in accordance with the California State Department of Agriculture's regulation for nursery inspections, rules and rating. All plants shall have a normal habit of growth and shall be sound, healthy, vigorous and free of insect infestations, weeds, plant diseases, sun scalds, fresh abrasions of the bark, excessive abrasions, or other objectionable disfigurements. Tree trunks shall be sturdy and have well "hardened" systems and vigorous and fibrous root systems that are not root or pot-bound. Root conditions of the plants provided by Contractor in containers will be determined by removal of earth from the roots of not less than two plants or more than 2 percent of the total number of plants of each species or variety. Where container-grown plants are from several sources, the roots of not less than 2 plants of each species or variety from each source, will be inspected. In case the sample plants inspected are found to be defective, the University's Representative reserves the right to reject the entire lot or lots of plants represented by the defective samples.
- B. Trees shall have one central leader. If the leader was headed, a new leader (with a live terminal bud at least one-half the diameter of the pruning cut) shall be present. Trunk caliper and taper shall be sufficient so that the lower five feet of the trunk remains vertical without a stake. Temporary branches on the lower trunk of trees should be maintained unless greater than 3/8 inch diameter. Clear trunk should be no more than 50percent of the total height of the tree. The attachment of major/scaffold branches shall be free of included bark. Each tree must include a minimum of three structural roots, reasonably distributed around the trunk (not clustered to one side). The root collar shall be within the upper two inches of the soil. The root system shall be reasonably free of stem girdling roots over the root collar or kinked roots from nursery production practices.
- C. The size of the plants shall correspond with that normally expected for species and variety of commercially available nursery stock or as shown on the Drawings. The

minimum acceptable size of all plants measured before pruning with the branches in normal position, shall conform with the measurements, if any, shown on the Drawings. Plants larger in size than specified may be used with the approval of the University's Representative. If the use of larger plants is approved, the ball of earth or spread of roots for each plant shall be increased proportionately.

- D. All plants not conforming to the requirements herein specified, shall be considered defective and such plants, whether in place or not, shall be marked as rejected and immediately removed from the site of the Work and replaced with new plants at the Contractor's expense.
- E. Pruning: At no time shall trees or plant materials be pruned, trimmed or topped prior to delivery and any alteration of their shape shall be conducted only with the approval and when in the presence of the University's Representative.
- F. Plant material shall be true to botanical and common name and variety as specified in "Annotated Checklist of Woody Ornamental Plants in California, Oregon and Washington," published by the University of California School of Agriculture (1979).
- G. Nursery Grown Stock:
 - 1. Grown under climatic conditions similar to those in locality of project.
 - 2. Container-grown stock in vigorous, healthy condition, not root-bound or with root system hardened off.
 - 3. Use only liner stock plant material which is well established in removable containers or formed homogenous soil sections.

2.09 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated.
 - 1. Seed Mix (at 10 lbs. per 1000 square feet) shall consist of 100 percent dwarf tall fescue varieties.
- C. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, non-toxic, free of plant growth or germination inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- D. Non-asphaltic Tackifier; Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, non-toxic and free of plant growth or germination inhibitors.

2.10 SOD

- A. Sod shall consist of 100 percent dwarf tall fescue varieties.

2.11 STAKING MATERIALS

- A. Lodge pole tree stakes

1. Provide 2 at each new planted tree as per detail.
2. Round and uniform with chamfered top and conical point.
3. 8 or 10 foot by 2 inches as required for height of tree
4. Pressure Treated Douglas Fir
5. Secure tree with tree ties.

B. Tree Tie:

1. ArborTie Tree Staking and Guying Material, or equal. Soft polypropylene with rounded weave and edge, 3/4" wide strap, break strength of 900 pounds.

2.12 WATER

- A. Provide or use only from University approved utility water source.

2.13 MULCH

- A. Shall be 100 percent shredded fir with an average particle size of 2 inches such as Walk On Bark, Redi Gro, Sacramento, or equal.
- B. In large or hard to access landscape areas pallet mulch may be used if approved by University's Representative - Nor Cal Blend, as supplied by Applied Landscape Materials, Rocklin, CA, or equal.

2.14 WOOD HEADERBOARDS

- A. Headerboards shall be 2 by 4 inch Redwood construction heart grade. Splices shall be made with 1 by 4 inch and shall not be less than 12 inches in length. Stakes shall be placed at intervals of not more than 4 feet and shall be 1 by 3 by 16 inches "construction heart redwood." All stakes shall be cut with level cut and set below top of headerboard.
- B. On sharp turns and curves, four 1/2 by 4 inch laminated boards or two 1 by 4 laminated boards may be permitted.
- C. Stakes and splices shall be nailed with galvanized common nails. Nail as required for solid installation.
- D. Provide headerboards as shown on the Drawings and herein specified laid true to line and grade, in a workmanlike manner. Care shall be exercised in laying wood headers to protect adjacent improvements, shrubbery and other properties from damage. All stakes shall be placed on the back side of headerboard (away from turf or pavement).

2.15 STEELHEADERS

- A. Steel Headers shall be 3/16 by 4 inch powder-coated black or galvanized, with 16 inch steel stakes.
- B. Provide headers as shown on the Drawings and herein specified. They shall be laid true to line and grade, and in a workmanlike manner. Care shall be exercised in laying metal

headers to protect adjacent improvements, shrubbery and other properties from damage.
All stakes shall be placed on landscape side of header.

2.16 DECOMPOSED GRANITE PAVING

- A. Size: 1/4 inch minus. Fines shall be evenly mixed throughout the aggregate.

<u>Sieve Designation</u>	<u>Percent Passing</u>
3/8"	100
No. 4	95-100
No. 8	75-80
No. 16	55-65
No. 30	40-50
No. 50	25-35
No. 100	15-25
No. 200	5-15B.

- B. Color: Gold or Brown. Color to be approved by University's Representative. Submit sample for approval prior to having material delivered.

C.

- D. Sources: Cascade Rock, Sacramento –Gold; Hastie's Capital Sand and Gravel, Sacramento – Premium DG; or equal.

E.

- F. Stabilizer: Non-toxic binder that is a colorless concentrated powder soil solidifier that binds decomposed granite or crushed 3/8 inch or 1/4 inch minus aggregate.

G.

- H. Contractor to provide delivery tags if pre-mixed. If mixed on site coordinate review and approval of mix operations with University's Representative.

2.17 SAND

- A. Washed Silica Sand

2.18 PLANTER DRAINAGE ROCK

- A. Drainage rock shall be 1/4 inch pea gravel and shall be clean, hard, durable, uniform in quality, and free of any detrimental quantity of soft, friable, thin, elongated, or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance.

PART III - EXECUTION

3.01 INSPECTION

- A. Obtain University Representative's written acceptance that planting soils have been cleaned of all construction debris, including gravel, concrete, concrete washout, paints, asphalt, etc. See Section 312219 Landscape Grading.

- B. Obtain University Representative's written acceptance that site soil compaction has been addressed and final grades have been established to within 1/10 foot prior to commencing planting operations. See Section 312219 Landscape Grading. Provide for inclusion of all amendments, settling, etc. Contractor shall be responsible for shaping all planting areas as indicated on Drawings.
- C. Prior to planting, inspect trees, shrubs and liner stock plant material for injury, insect infestation and trees and shrubs for improper pruning.
- D. Do not begin planting of trees until deficiencies are corrected or trees are replaced.
- E. All finish grading, soil preparation and irrigation work must be complete and accepted (included irrigation coverage test) prior to the installation of any plants.

3.02 PLANTING INSTALLATION

A. General

- 1. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.
- 2. Containers shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.

B. Pre-plant Weed Control

- 1. If live perennial weeds exist on site at the beginning of work, spray with a non-selective systemic contact herbicide, as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least 15 days to allow systemic kill. Clear and remove these existing weeds by mowing or grubbing off all plant parts at least 1/4 inch below the surface of the soil over the entire area to be planted.
- 2. After irrigation system is operational, apply water for 5 to 10 days as needed to achieve weed germination. Apply contact herbicides and wait as needed before planting. Repeat, if required by University's Representative.
- 3. Maintain site weed free until final acceptance by the University's Representative.

C. Soil Preparation

- 1. After approximate finished grades have been established, soil shall be conditioned and fertilized in the following manner. Amendments shall be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top 12 inches of soil.
- 2. Application Rates: (Per 1,000 square feet): The following organic, soil amendments and fertilizer establish minimum requirements. Specific amendments and fertilizer amounts will be determined after rough grading operations are complete and soil samples are tested by the Contractor and approved by the University's Representative, see Section 312219 Landscape Grading. The amounts listed below are considered minimum amounts for the project unless directed otherwise by the University Representative. Delivery tags

for all specified amendments shall be provided to University's Representative prior to installation.

- a. Nitrogen stabilized organic amendment or compost – 6 cubic yards for groundcover and shrub beds, 3 cubic yards for lawn areas. University's Representative may request delivery tags.
 - b. Planting fertilizer - 15 lbs.
 - c. Gypsum - 20 lbs.
 - d. Soil sulphur - 20 lbs.
 - e. Iron – 2 lbs.
- D. Layout of Major Plantings: Locations for plants and outlines of areas to be planted shall be marked on the ground by Contractor before any plant pits are dug. All such locations shall be approved by the University's Representative. If underground construction or a utility line is encountered in the excavation of planting areas, other locations for planting may be selected by the University's Representative.
- E. Planting of Trees and Shrubs:
1. Excavation for planting shall include the stripping and stacking of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits and planting beds.
 2. Excess soil generated from the planting holes and not used as backfill or in establishing the final grades shall be removed from the site.
 3. Protect all areas from excessive compaction when trucking plants or other material to the planting site.
 4. All excavated holes shall have vertical sides and shall be of a size that is three times the diameter and 1 and 1/2 times the depth of the root ball for all trees and shrubs. After pits are dug, roughen the sides of the pit and loosen soil in the bottom of the pit to a depth of 3 inches. Construct foot-tamped mound in the bottom of the pit to support the plant at the proper level.
 5. All prepared tree pits must be reviewed and approved by the University's Representative prior to the planting of any trees.
 6. Percolation tests are required for 1 out of every 5 trees planted, for and every bioswale or stormwater collection feature on a given site. Tree pits from each planting area of the project shall be tested for percolation. However, in areas where over-excavation of a building foundation has occurred, or any other construction practice typically resulting in extremely compacted subsoil conditions, all tree pits must be tested for percolation. Tree pits and bioswales shall be filled with water and the drainage rate observed. Percolation rate shall be a minimum of the depth of the tree pit or bioswale within 24 hours. If percolation/drainage rate is less than that - mitigation measures shall be implemented (see Soil Cleanup, Replacement and Preparation paragraph above).

7. Do not handle container plants by the tops, stems or trunks at any time. Lift all plants so that the root ball is supported from the underside.
8. Plants that do not have a satisfactory root system may be rejected at the discretion of the University's representative. The outer surfaces of plants and trees shall be shaved to remove all circling, descending, and matted roots. Shaving shall be performed using saws, knives, sharp shovels or other equipment that is capable of making clean cuts on the roots. University's Representative must be contacted prior to root pruning all trees in order to coordinate observation of root pruning practices with the Campus Arborist. Modifications required to make the root system of plants and trees conform to plant quality standards shall not be considered as grounds to modify or void the plant warranty.
9. Center plant in pit or trench. Crown of trees shall be 1 inch minimum above finish grade. Crown of shrubs shall be 1 inch above finish grade.
10. Face plants with fullest growth into prevailing wind.
11. Set plant plumb and hold rigidly in position until soil has been tamped firmly around ball or roots.
12. Backfill for trees and shrubs shall consist of amended native soil. If native soil is unsuitable or contaminated, use imported topsoil as specified above.
13. All plants which settle deeper than the surrounding grade shall be raised to the correct level. After the plant has been placed, additional backfill shall be added to the hole to cover approximately 1/2 of the height of the root ball. At this stage, water shall be added to the top of the partly filled hole to thoroughly saturate the root ball and adjacent soil.
14. Container Removal:
 - a. Cut containers on 2 sides with a can cutter designed for the job.
 - b. Do not injure root ball.
 - c. Do not cut containers with spade or ax.
 - d. After removing plant, superficially cut edge roots with knife on 3 sides.
15. Box Removal:
 - a. Remove bottom of plant boxes before planting.
 - b. Remove sides of box without damage to root ball after positioning plant and partially backfilling.
16. Plant Tablets:
 - a. After the water has completely drained, planting tablets shall be placed as indicated below.

- b. Planting tablets shall be set with each plant on top of the root ball while the plants are still in their containers so the required number of tablets to be used in each hole can be easily verified by the University's Representative.

17. Backfill

- a. The remainder of the hole shall then be backfilled with 2/3 native soil and 1/3 organic amendment thoroughly blended and tamped firm.
- b. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be of a depth sufficient to hold at least 2 inches of water. The basins shall be constructed of amended backfill materials. Remove basin in all turf areas after initial watering.

18. Pruning shall be limited to the minimum necessary to remove injured twigs and branches, and to shape the plant material as directed by the University's Representative. Pruning shall not be done prior to delivery of plants.

19. Staking: Staking of all trees shall be completed immediately after planting. All stakes shall be installed as indicated in Drawing details.

F. Planting of Groundcovers:

- 1. Groundcover plants shall be grown in flats or gallon containers as indicated on the Drawings. Flat grown plants shall remain in those flats until transplanting. The flat's soil shall contain sufficient moisture so that it will not fall apart when lifting the plants.
- 2. Groundcover shall be planted in straight rows and evenly spaced, unless otherwise noted, and at intervals called out in the Drawings. Triangular spacing shall be used unless otherwise noted on the Drawings.
- 3. Each rooted plant shall be planted with its proportionate amount of flat or container soil. Plantings shall be immediately sprinkled with water after planting until the entire area is soaked to the full depth of each hole.
- 4. Care shall be exercised at all times to protect the plants after planting. Any damage to plants by trampling or other operations shall be repaired immediately.

G. Mulch

- 1. All groundcover, perennial, and shrub beds shall be dressed with a 3 inch layer of mulch, where slopes are not steeper than 2:1.
- 2. Pre-emergent weed control product shall be applied to all planting areas after completion of planting and prior to mulch application. Use Dimension, or equal and apply per manufacturer's recommendations.

H. LAWN

- 1. Seeded Lawn (see pre-plant weed control)
 - a. Install soil amendments and finish grading as specified. Allow for settlement.

- b. Broadcast seed evenly at the rate of 12 pounds per 1000 square feet.
- c. Rake seed bed lightly to cover seed with soil.
- d. Cover seed with 1/8 inch to 1/4 inch layer of amended soil. Seed cover shall not exceed 1/4 inch.
- e. Roll seedbed with 200 pound roller. Finished surface shall meet finish grades shown.
- f. Water thoroughly.
- g. At end of maintenance period, lawn shall be dense, uniform, healthy and free of weeds, diseases or bare spots.
- h. At Contractor's option, lawn may be hydroseeded.

2. Hydroseeding

- a. Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
- b. Mix slurry with non-asphaltic tackifier.
- c. Apply slurry uniformly to all areas to be seeded in a one step process. Apply mulch at the minimum rate of 1500 pound per acre dry weight but not less than the rate required to obtain specified seed-sowing rate.
- d. Acceptance of all seeded areas will be based on growth of a uniform color and dense stand of grass, without bare spots of over 4 inches square. If grass is not established prior to the end of the maintenance period Contractor shall provide an additional hydroseed application and shall continue maintenance until seeded areas are accepted by the University's Representative.

3. SOD

- a. Lay sod immediately upon delivery.
- b. Finish grade sodbed to remove ridges and depressions. Roll with 200 pound roller.
- c. University's Representative will review and approve sodbed before installation.
- d. Butt strips tightly together. Stagger joints.
- e. Roll sod after installation with 200 pound roller.
- f. Water thoroughly.

- g. At end of maintenance period, lawn shall be dense, uniform, healthy, and free of weeds, diseases or bare spots.

3.03 HEADERBOARD INSTALLATION

A. Wood and Steel Headers:

1. Headers: Install header true to line and grade as shown on the Drawings. Align header edges and set flush with adjacent paving.
2. Stakes: Stakes shall be a minimum of 12 inches long for wood and 16 inches for metal, and longer as required for solid anchorage.
3. Header is not required where perimeter of decomposed granite is bounded by a concrete curb or slab.
4. Landscape edging is to remain in place, securely staked to hold firmly to approved line and grade.
5. After finished compacted path surface has been achieved, finish adjacent shoulder by backfilling back of header with stockpiled topsoil, compacting to match existing undisturbed ground and slope to required grade and cross section.

3.04 DECOMPOSED GRANITE PAVING

A. Decomposed Granite Paving:

1. Install decomposed granite on the prepared sub base in two lifts of equal depth, or one 2 inch lift over 2-3 inches of compacted aggregate base per the Drawing details.
2. Thoroughly compact each lift to a minimum 90 percent. Compact each area with at least 4 passes of the compacting equipment. Hand tamp edges around benches, signposts etc. After compacting, screed smooth.
3. Level and water so that moisture permeates the full depth to further compact the decomposed granite and determine correct finish grades. Watering is best accomplished using a garden hose with spray nozzle set to a coarse spray; pressure shall not disturb leveled path surface. Add sufficient water to thoroughly wet decomposed granite without excess "free" water.
4. Correct any deficiencies or low spots by adding additional decomposed granite material and re-compacting the area(s) with both equipment and water

application. The previously rolled or compacted area shall be raked to provide a bond with the added material.

- B. Stabilized Decomposed Granite Paving:
1. Thoroughly and uniformly blend 16 pounds of stabilizer per 1-ton of decomposed granite. Bucket blending or rake blending is not acceptable. Blend material dry.
 2. Install decomposed granite per above specifications.
 3. Grade, contour and compact the decomposed granite to final elevations.
 4. Water heavily after each lift is installed for full-depth moisture penetration. 25-45 gallons of water per 1 ton shall be applied.
 5. Upon moisture penetration compact each decomposed granite lift to 85 percent relative compaction with a steel drum roller.
 6. In the event of damage or defective installation the contractor shall repair and replace in accordance with these Specifications at no additional cost to the University.

3.05 CLEAN UP

- A. During the progress of the Work, the Contractor shall keep the Project site in a neat and clean condition that is free of debris to the satisfaction of the University's Representative. All materials and debris accumulated in conjunction with completing this Work shall be legally recycled or disposed of by Contractor off campus. Refer to Section 017400 Cleaning and Waste Management. Remove all trash, excess soil, empty plant containers and rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site.
- B. The Contractor shall leave the site area broom-clean and shall wash down all walkways and other paved areas, leaving the premises in a clean and safe condition.
- C. Promptly remove soil and debris created by hydroseed work from paved areas and building walls. Clean wheels of vehicles before leaving site to avoid tracking soils onto surfaces of roads, walks, or other paved areas.

3.06 MAINTENANCE & PLANT ESTABLISHMENT

- A. General: Maintain all plants and planting areas from time of delivery, through installation and maintenance period, until final acceptance.
- B. Schedule: Submit proposed maintenance work schedule to University's Representative in writing for review at least 30 days prior to commencement of maintenance work. Maintenance work shall be done at times accepted by University. Contractor's maintenance crew must be present at the project site at least once a week and as often as necessary to perform specified maintenance.
- C. Maintenance Procedures
1. General: Maintenance of new planting includes but is not limited to watering, cultivating, fertilizing, weeding, mulching, re-staking, resetting plants to proper

grades or upright positions, restoring watering basins, maintaining lawns, removal of dead flowers and broken twigs, pest, disease and weed control, erosion control, restoring finish grades with accepted and tested imported topsoil, and taking precautions as necessary to prevent sunscald damage. Remove nursery tags and repair mulch 10 days before final acceptance.

2. Lawn maintenance: Lawns shall be mowed to a height of 2 inches when reaches a height of 3 inches. Lawns must be mowed a minimum of two times during maintenance period. Edges must be trimmed at least twice a month and all grass clippings removed and disposed of.
 3. Young tree pruning shall be conducted during the maintenance period by the Contractor as approved by the University's Representative after review by the Campus Arborist and in accordance with the University's standard tree pruning practices. Refer to Section 01 56 39 Tree and Plant Protection. Trees shall be pruned to encourage the growth of strong central leaders where applicable. Contractor shall notify University's Representative 48 hours in advance of any pruning operations.
 4. Protection: Protect planting areas and plants against damage until final acceptance. Maintenance also includes temporary fences, barriers, and signs as required for protection. Treat or replace damaged plants as directed by University's Representative at no additional cost to University.
 - 5.
 6. Fertilization: Apply potassium sulfate and 16-6-8 fertilizer at the rate of 6 pounds each per 1000 square feet, 30 days after installation.
 7. Weed control:
 - a. Keep site free of weeds during maintenance period.
 - b. Identify weeds and apply accepted control methods.
 - c. Herbicides, if used, shall be applied by licensed Pest Control Operator according to manufacturer's recommendations.
- D. Observation for Maintenance Period Commencement:
1. Request after work of this section and Section 32 84 00 Planting Irrigation is substantially complete. Maintenance Period shall begin upon written notice of acceptance by University's Representative and shall continue for a minimum of 90 days until final acceptance by University's Representative.

END OF SECTION 329000

**SECTION 33 05 13
MANHOLES AND STRUCTURES**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Modular precast concrete manhole bases, sections with tongue-and-groove joints, covers, and accessories for sanitary sewer and storm drain systems. Section also includes cast in place manhole bases.

1.2 RELATED SECTIONS

- A. Section 01 33 23 Shop Drawings, Product Data and Samples
- B. Section 01 43 00 Quality Assurance
- C. Section 01 57 23 Storm Water Pollution Prevention
- D. Section 09 99 00 Painting and Coating
- E. Section 30 20 00 Earthwork
- F. Section 31 23 33 Trenching and Backfilling

1.3 REFERENCES

- A. American Concrete Institute (ACI) 308 - Standard Specification for Curing Concrete
- B. ACI 318 - Building Code Requirements for Structural Concrete
- C. American Society for Testing and Materials (ASTM) A48/A48M - Standard Specification for Gray Iron Castings
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- E. ASTM C150 - Standard Specification for Portland Cement
- F. ASTM C443 REV A- Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- G. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
- H. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
- I. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
- J. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures
- K. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill

- L. Corps of Engineers Specification No. CRD-C572 - Handbook for Concrete and Cement Corps of Engineers Specification for Polyvinylchloride Waterstop.
- M. The term "State Standard Specifications" is understood to refer to the Standard Specifications, State of California, Business, Transportation and Housing Agency, Department of Transportation (CALTRANS), May 2006 edition. In cases of conflict between the State Standard Specifications and these specifications, these specifications shall govern.
 - 1. Any provisions for measurement and payment specified within the State Standard Specifications shall be disregarded and the provisions of this contract shall govern.

1.4 SUBMITTALS

- A. See Section 01 33 23 Shop Drawings, Product Data and Samples for submittal procedures.
- B. Product Data: Submit product technical data acknowledging that products meet requirements of standards referenced.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.
- D. Laboratory Testing: Submit results of laboratory compression testing on precast concrete.

PART 2 - PRODUCTS

2.1 MANHOLE SECTIONS, BASES, RISERS AND TOPS

- A. Concrete: State Standard Specifications, CALTRANS Section 90-10, Minor Concrete, conforming to ACI 308, ACI 318, and ASTM C150.
- B. Manhole sections, bases, risers and tops: Precast reinforced concrete per ASTM C478, with resilient connectors per ASTM C923.
- C. Provide precast reinforced manholes, frame and cover as indicated on Drawings and as detailed. Inside dimensions, depth, clear lid opening, and pipe penetrations shall be as indicated on the Drawings. Cone section shall be eccentric.
- D. Cast-in-place concrete bases may be used as an alternative to a precast concrete bases. Concrete shall conform to CALTRANS Section 90 and shall be Class "A" containing six packs of Portland Cement per cubic yard of concrete with a minimum design compressive strength of 3,000 psi after 28-days. Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be the size shown on the Drawings. Provide waterstop for cast-in-place bases in accordance with manufacturer's instruction. PVC waterstops shall be manufactured from virgin polyvinyl chloride conforming to the Corps of Engineers Specification No. CRD-C572.
- E. For pipe penetrations through manholes, core through, install gasket around pipe, grout penetration on both sides and install a minimum of 6 inches (thickness and distance) around collar outside of the manhole or inlet structure penetration. Connections shall be A-lok for ductile iron pipe, Kor-n-seal for PVC pipe, or equal.
- F. Manhole water proofing sealers shall be applied to exterior concrete and shall be TREMproof 60 as manufactured by Tremco, 10701 Shaker Blvd., Cleveland, Ohio 44104; Duramem V500 as manufactured by Pecora Corporation, 2601 Oakland Avenue, Garland, Texas 75040; Thideck C.F. as manufactured by Toch/Carboline company, 350 Hanley Industrial Court, St. Louis, Missouri 63144; or equal.

2.2 MANHOLE FRAME AND COVER

- A. Frame and Cover: Cast iron per ASTM A48 Class 35B and conforming to Section 55-2.03 and 75-1.02 of the CALTRANS Standard Specifications. Manhole frame and cover shall be D&L Supply A-1024, South Bay Foundry SBF 1900 CPH, or equal.
- B. Provide Frame and Cover as detailed and shall be H-20 traffic rated.

2.3 MANHOLE SEALANT GASKETS

- A. Precast reinforced concrete sewer manhole sections shall be joined with rubber gaskets conforming to ASTM C443. Sealant gaskets shall be Ram-Nek, Kent Seal, or equal. Use of mortar will not be allowed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of manhole structures shall conform to ASTM C478 and ASTM C891.
- B. Excavation and backfill for manholes shall conform to the applicable provisions of Section 30 20 00, Earthwork and Section 31 23 33, Trenching and Backfilling.
- C. Place concrete base pad, trowel top surface level. Set precast manhole base unit level on the base material or concrete work slab as specified herein for a cast-in-place base.
- D. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad. Place manhole cylinder plumb and level, to correct dimensions and elevations.
- E. Cut and fit for pipe.
- F. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- G. Set cover frames and cover level without tipping, to correct elevations.
- H. Installation shall comply with requirements of Section 01 57 23 Storm Water Pollution Prevention.
- I. Water Proofing Sealer
 - 1. Elastomeric waterproofing sealer shall be applied according to manufacturer's recommendations. Thoroughly sandblast the section of the manhole frame over which the sealer is to be applied, the manhole header, extension and cone and the top 12 inches of the manhole riser.
 - 2. All surfaces shall be free of dust, oil, rust, loose materials and other contaminants. Take necessary precautions to prevent rebound from the sandblasting operation to enter the sewer system.
 - 3. A plastic barrier shall be applied on top of sealer to prevent sealer from rubbing off during backfilling.
- J. To prevent concrete corrosion, a protective coating shall be applied to the interior concrete surface of the manhole. Coating shall be Sauereisen Sewerguard No. 210S or equal and applied per manufacturer's recommendations.

3.2 TESTING

- A. Precast, reinforced, concrete manhole bases, risers and tops shall be tested in accordance with ASTM C497 by an approved testing laboratory, for concrete compression tests on cores drilled from 5 percent of the lot.
- B. When the groundwater table is too low to permit visual detection of leaks, 20 percent of the total of all manholes shall be hydrostatically tested. The test shall consist of plugging all inlets and outlets and filling the manhole with water to a height determined by the University's Representative. Leakage in each manhole shall not exceed 0.2 gallon per hour per foot of head above the invert over a period of 30 minutes. A manhole may be filled 24 hours prior to time of testing, if desired, to permit normal absorption into the pipe walls to take place. Repair all manholes that do not meet the leakage test, or are unsatisfactory from visual inspection, to conform to the requirements herein, at no additional cost to the University. If more than 25 percent of the manholes tested fail the hydrostatic test, the Contractor will be required to test all or as many manholes as the University's Representative may deem necessary.
- C. Manhole vacuum testing per ASTM C1244 will be acceptable as an alternative to hydrostatic testing. A minimum of 9 inches of mercury shall be held for a minimum time of one minute.
- D. Perform field inspection and testing in accordance with Section 01 43 00 Quality Assurance.
- E. Precast, reinforced, concrete manhole bases, risers and covers shall be subject to rejection for failure to conform to any of the Specification requirements. In addition, individual sections of manhole risers and covers may be rejected for any of the following reasons:
 - 1. Fracture or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
 - 2. Defects that indicate imperfect proportioning, mixing, or molding.
 - 3. Surface defects indicating honeycombed or open texture.
 - 4. Damaged ends, where such damage would prevent making a satisfactory joint as determined by the University's Representative.
 - 5. The internal diameter of the manhole section varying more than 1 percent from the nominal diameter.
 - 6. Any continuous crack having a surface width of 0.01 inch or more and extending for a length of 12 inches or more, regardless of the position in the section wall.

END OF SECTION 33 05 13